

# A I AUTOMOTIVE INDUSTRIES

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY  
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT

ENGINEERING • PRODUCTION • MANAGEMENT

MAY 1, 1950

## *In This Issue . . .*

**Powerglide Machining Standards**

**Aircooled Diesel of Unique Design**

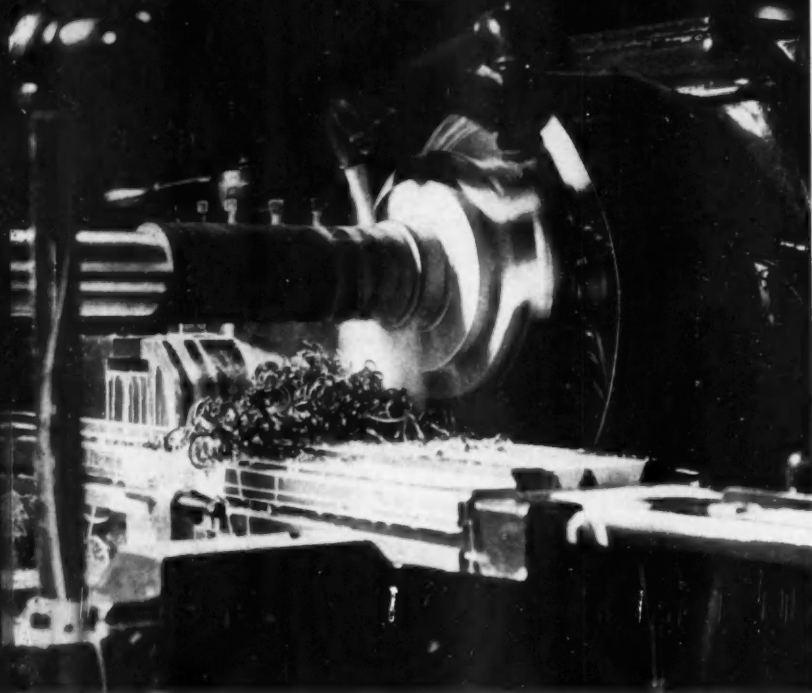
**What's New at Indianapolis**

**Two Fast Inspection Methods**

**Increasing Ball Bearing Production**

*Complete Table of Contents, Page 3*

A CHILTON PUBLICATION



## Can this many-purpose cutting fluid solve a problem for you?

• Do you have machining operations that give trouble with every cutting fluid you try? When cutting oils are used, tools and work overheat? With water emulsions or soluble oils, are tool life and finish poor? STANICOOL HD Soluble Oil has taken over many such jobs and has saved tools, parts, and machining time.

As a water emulsion, it has excellent cooling ability... gives finish and tool life approaching what you can get with cutting oil. It can handle many of your heavy cutting operations... save you the costly use of special cutting oils. On top of that, STANICOOL HD gives you the economy of soluble oil and these five advantages:

- Mixes readily
- Does not gum up machines and work
- Is non-irritating to operators' hands

### STANICOOL HD TRADE MARK Soluble Oil

- Is stabilized against odor development
- Has anti-rust qualities

To take full advantage of this many-purpose cutting fluid, call on the services of a Standard Oil cutting-oil specialist. His headquarters are near your plant. How you can benefit by his on-the-spot service is explained at the right.

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

## What's YOUR problem?

• Cutting? Stamping? Quenching? Whatever your problem, Standard Oil has a corps of cutting-oil and lubrication specialists located throughout the Midwest to help you solve it. One of these men is near your plant. You can get his services quickly and easily. His wide experience and special training in the use of modern lubricants and cutting fluids will help you make real savings.

Why not arrange, today, for his visit by contacting the nearest Standard Oil (Indiana) office? To start the ball rolling, discuss with him the advantages of:

**STANICUT Cutting Oils**—These special-duty cutting oils meet today's most exacting requirements and highest production schedules. Grades varying in viscosity and compounding are available, each containing the correct proportions of extreme-pressure and friction-reducing ingredients.

**STANOSTAMP Compounds**—Here are three established products for stamping or heavy drawing operations on either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications.

STANOSTAMPS offer maximum protection for dies and work, can be readily removed in conventional washing equipment.

**SUPERLA Quenching Oil**—From Standard Oil's complete line of quenching oils, this product is recommended for quenching work in systems where cooling facilities are limited and bath temperatures are high. It is a medium-bodied oil of red color. It provides efficient quenching of large forgings.

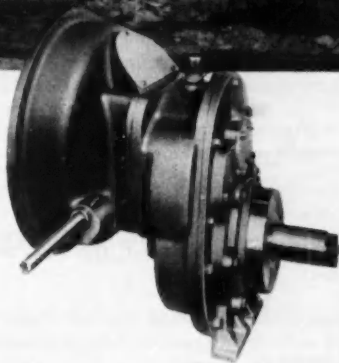
# STANDARD OIL COMPANY (INDIANA)



# Converts from steam to diesel engine with **COTTA** Reduction Unit



When Lincoln Crushed Stone Co. of Joliet, Illinois converted a crane from steam to diesel engine, a Cotta Model SRIOE Reduction Unit was used to adapt new engine output speed to meet conditions in the original crane mechanism. The result—a modernized crane at remarkably low cost. Cotta Reduction Units come in a broad range of ratios, with input torque from 150 to 1350 foot pounds. For use on cranes, shovels, rock crushers, generators, pumps, etc. Do you have a rebuilding or speed reduction problem?



#### THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem — COTTA engineers will help you select the right unit for best performance. May we work with you?

**COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS**



# COTTA

**HEAVY-DUTY  
REDUCTION UNITS**

"Engineered-to-order"

**1750 POUNDS MORE PAYLOAD**... Actually, 235 gallons of oil can ride free on every trip because Butler Manufacturing Company of Kansas City, Mo., fabricated this tank trailer unit of "Cor-Ten"... a copper-chromium-nickel high strength steel produced by the Carnegie-Illinois Steel Corp., Pittsburgh 30, Pa. The use of "Cor-Ten" reduced dead weight approximately 1750 lbs. as compared with carbon steel, yet increased safety through increased strength.



# Lower Haulage Costs

**WITH HIGH STRENGTH LOW ALLOY STEELS**

**CONTAINING**

## Nickel

Add load capacity... cut dead weight... increase durability.

Producers as well as owners of vehicles secure multiple savings by utilizing high strength low alloy steels containing nickel, because these steels provide three basic advantages:

1. *High strength in the as-rolled condition, permitting important weight reductions.*
2. *Excellent response to such fabricating operations as forming and welding.*
3. *Exceptional resistance to corrosion, abrasion and impact.*

Although moderate in price, this type of steel has established notable performance records. A list of sources of supply will be furnished on request.

**SAVES 1200 POUNDS PER UNIT**... Axle to axle, this "frameless" tanker is entirely without supporting members. The suspended shell carries its own weight and that of the load, aided by the sump which acts as a stiffener. To secure substantial weight saving and yet retain maximum strength and stamina, Fruehauf Trailer Company's plant in Los Angeles, Calif., fabricates frameless tank trailers from nickel alloyed high strength low alloy steels such as "Cor-Ten," and saves 1200 lbs. per unit.



**25% LESS BODY WEIGHT**... This truck body is 12' long x 6½' wide x 6' high. If constructed from carbon steel, it would weigh approximately 2060 lbs. However, more than 475 lbs. is cut from its dead weight, with no sacrifice of strength or safety, because the Auto Truck Equipment Company of Pittsburgh, Pa., fabricates the body from "Cor-Ten."



**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 WALL STREET  
NEW YORK 5, N.Y.



# AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

May 1, 1950

Vol. 102, No. 9

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AUTOMOTIVE INDUSTRIES, May 1, 1950

**radiators**  
for every  
automotive  
application

engineered  
and  
manufactured  
by

**YOUNG**  
**HEAT TRANSFER**  
**PRODUCTS**

**YOUNG RADIATOR CO.**  
General Offices: Dept. 100-E, Racine, Wisconsin  
Plants at Racine, Wisconsin, and Matteson, Ill.

**AUTOMOTIVE PRODUCTS**  
Gas, gasoline, Diesel engine cooling radiators  
• Heat exchangers • Intercoolers • Oil coolers  
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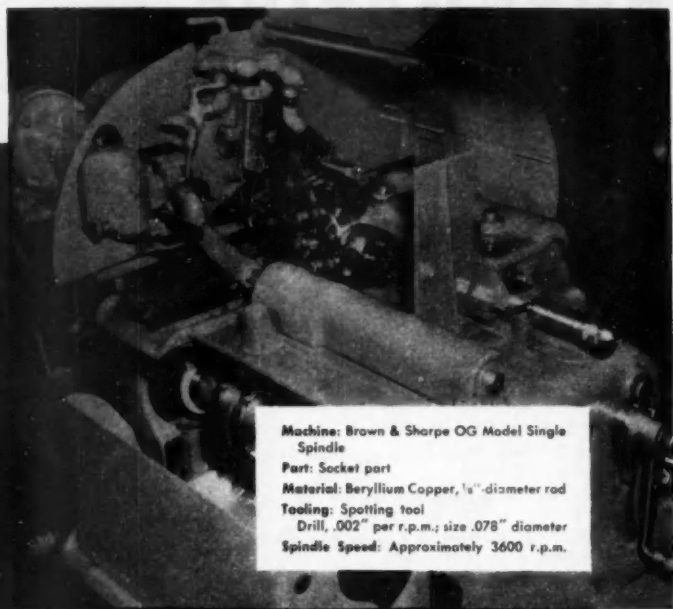
**OIL FIELD, HEAVY INDUSTRIAL, MUNICIPAL & CHEMICAL PROCESS COOLING EQUIPMENT**  
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**3 TIMES  
LONGER  
DRILL  
LIFE**

**and NO MORE STAINS\***



Machine: Brown & Sharpe OG Model Single Spindle

Part: Socket part

Material: Beryllium Copper, 1/8" diameter rod

Tooling: Spotting tool

Drill: .002" per r.p.m.; size .078" diameter

Spindle Speed: Approximately 3600 r.p.m.

## **WHEN this operation was performed with Texaco Cleartex Cutting Oil**

**F**OUR major benefits resulted when the cutting coolant on the job described was changed to *Texaco Cleartex Cutting Oil*: (1) drills lasted three times as long; (2) uniform hole size was maintained; (3) staining of copper was eliminated; and (4) lubrication expense was reduced because *Texaco Cleartex Cutting Oil* can be used as both coolant and machine lubricant.

These benefits and economies are typical. Every day, in plants all over the country, Texaco Lubrication Engineers are helping to improve metal-

working operations and reduce costs.

*Texaco Cleartex Cutting Oil* is just one of a complete line of Texaco Cutting, Grinding and Soluble Oils . . . designed to meet all operating conditions and assure better, faster, lower cost machining.

Let a Texaco Lubrication Engineer help you select the right coolants to assure these benefits in your plant. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

\*Name of this Texaco user on request.

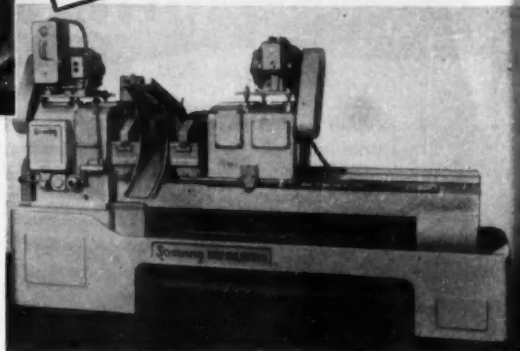
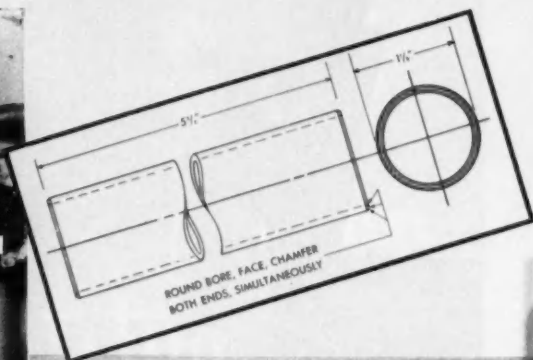
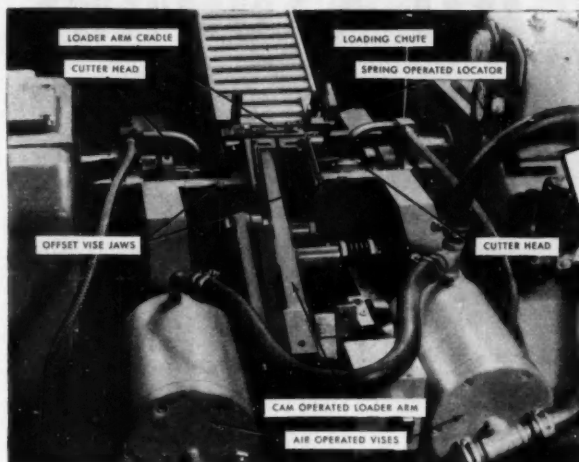


**TEXACO CUTTING, GRINDING AND  
SOLUBLE OILS FOR FASTER  
MACHINING**

**TUNE IN . . . TEXACO STAR THEATER** starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

# MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



## MODEL "CS" Lo-swing SPEEDS MACHINING OF SHOCK ABSORBER TUBES

**Problem:** To automatically load, unload and machine both ends of Hydraulic Shock Absorber Tubes at high production rate.

**Solution:** The Model "CS" Lo-swing Automatic Drilling and Centering Machine selected for this job was equipped with an automatic loader of the type shown in the small illustration.

The tubes, which are cut 1/16" over the required length, are fed into the upper chute, shown in the large illustration, and ejected into the lower chute after being machined. Details of the loading arm, which is cam operated, are also shown in this illustration. Tubes are fed by gravity down the loading chute into the loading arm cradle where they are properly positioned lengthwise by a spring operated locator. The loading arm then lowers the tube into the air-

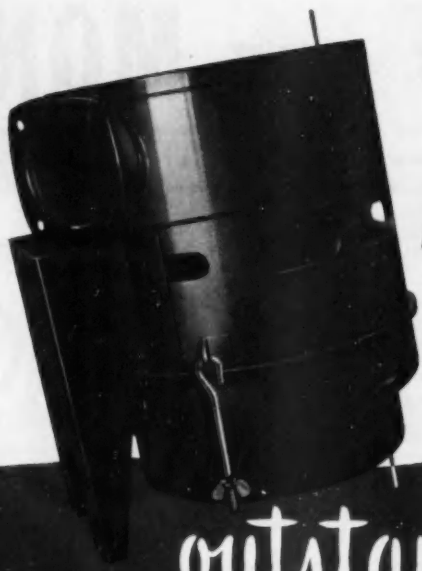
operated vise jaws where it is securely clamped, after which the loading arm is raised to pick up the next piece.

When the loading phase of the cycle is completed, the two revolving cutter heads advance in rapid traverse and slow down into feed just before the tools reach the work. Three cutters are used in each head . . . one cutter for facing to overall length, one for rounding the bore, and one for chamfering the O.D. The machining completed, the cutter heads retract in rapid traverse and the vise jaws open, allowing the finished part to drop into the unloading chute. The complete cycle is slightly under five seconds per piece, assuring a production of 750 pieces per hour.

Engineered jobs are our specialty. Seneca Falls is at your disposal to assist in solving your problem.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing



# UNITED Air Cleaner

Helps WHITE TRUCKS  
Achieve...

*outstanding mileage*

United Oil Bath Air Cleaners have helped measurably in building the high mileage records for which White trucks are noted. Equipped with efficient United cleaners, these "million mile favorites of transport operators" are protected against every kind of abrasive harmful to the delicate internal parts of an engine—from fine desert alkali to city soot. This protection adds miles of life to rings, pistons, sleeves and bearings.

Trucks, cars, tractors, stationary and portable engines have benefited from United Oil Bath Air Cleaner protection for almost 30 years. With over 260 models available, there is a United Oil Bath Air Cleaner for every type of internal combustion engine. Our sales engineers can help you with up-to-the-minute counsel on your design problems.



Shown here is a White truck, one of the great "million mile" trucks. The United Oil Bath Air Cleaner is standard equipment for this truck.

## UNITED SPECIALTIES COMPANY

United Air Cleaner Division — Chicago 28, Mitchell Division — Philadelphia 36

AIR CLEANERS • METAL STAMPINGS • DOVETAILS •  
IGNITION AND TURN SIGNAL SWITCHES • ROLLED SHAPES

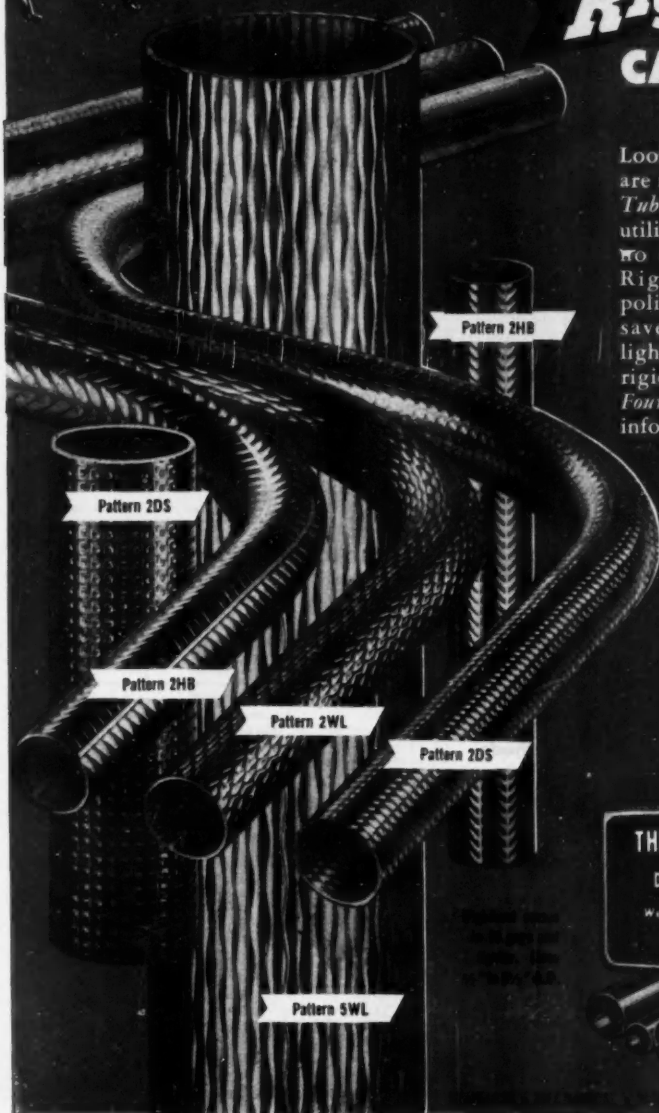


Now—1001 New Opportunities with

# "Standard" Rigidized

## CARBON STEEL TUBING

Look over *your* product. There are many ways in which *Rigidized Tubing* will improve its design, utility and eye appeal at little or no added cost. Here's why—Rigidized Tubing needs no polishing before chrome plating, saves weight through use of lighter gage metals and has more rigidity and buckling strength. *Four attractive patterns.* Write for information today.



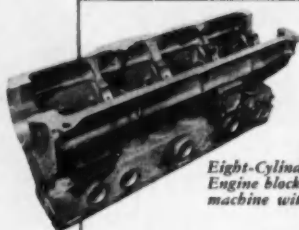


# How

**SIDE AND BOTTOM  
MACHINING OPERATIONS  
ON ENGINE BLOCKS ARE**

*Completed automatically*

## **BARNES 6-Station PROGRESS-THRU MACHINE**



*Eight-Cylinder Automobile Engine block is fed through machine with pan rail up.*

### **61 Operations Combined in Four Working Stations**

Here is another example of the profitable advantages of combining operations on a W. F. & John Barnes "Progress-Thru" type machine. For an automobile manufacturer, the machine reduces work handling, conserves floor space, and assures uniform accuracy. In a continuous automatic cycle, 52 drilling, 25 chamfering, and 4 reaming operations are completed in 29 seconds. At 100% efficiency, it produces 125 blocks per hour. All operations are performed in four working stations. Overall length of machine is only 29 feet, 4 inches.

### **Designed to Insure Flexibility for Future Needs**

Of unit-type construction, the machine has standardized bases and self-contained sliding heads which provides flexibility for meeting future needs. Fixture bases are in sections. Extra stroke and heavy-duty spindles are provided. A minimum of 20" between units assures easy accessibility that saves set-up time. Hydraulic piping and limit switches are mounted in the open for convenient maintenance.

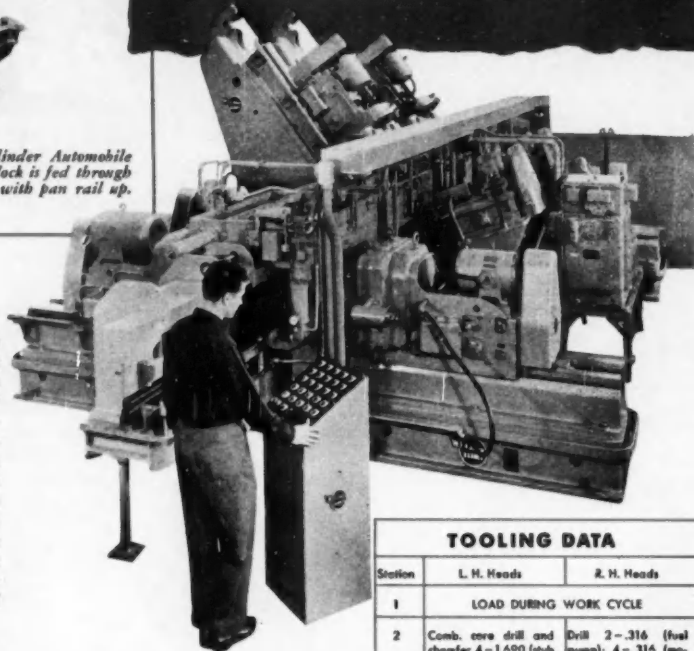
A built-in chip conveyor is provided. Design features like these help you cut costs and get bigger returns on your investment.

### **Ask for an Analysis of Your Machining Methods**

Write today and find out how a W. F. & John Barnes machine can be designed to help you cut costs. Ask for an analysis of your machining methods. No obligation.

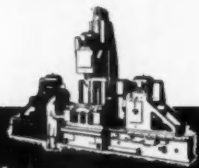
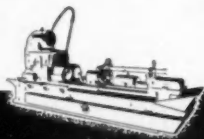
### **W. F. & JOHN BARNES COMPANY**

312 South Water Street • Rockford, Illinois, U. S. A.



### **TOOLING DATA**

Station	L. H. Heads	R. H. Heads
1	LOAD DURING WORK CYCLE	
2	Comb. core drill and chamfer 4-1.690 (stub spindles). Drill 4-.316 (motor mount holes); 2-.368 (generator bracket); 2-.316 (water outlet boss); 1-.261 (vent cover).	Drill 2-.316 (fuel pump); 4-.316 (motor mount); 5-.216 (valve cover); 1-.4531
3	Ream 4-1.693 (stub spindles). Chamfer 6-.316; 2-.368; 1-.261.	Drill 1-.348 (in distributor base).
4	Drill 5-.3125 halfway (from crank to cam bearings).	Drill 1-.0625 (thru distributor base).
5	Finish drill 5-.3125 (thru crank to cam bearings).	Chamfer 6-.316; 5-.261; 1-.4531.
6	UNLOAD DURING WORK CYCLE	

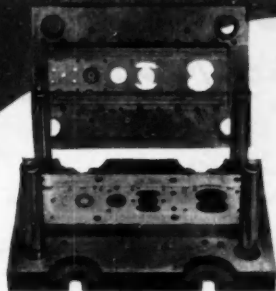


**Multiple Spindle Drilling, Tapping, Boring and Reaming Machines**

*160 pieces a minute to tolerances  
of less than .0005"!*



## ***DANLY PRECISION DIE SET***



Die built by the Sherman Tool & Die Co., Charlestown, Massachusetts, for the Signal Manufacturing Co., Lynn, Massachusetts, in a Special Danly Precision Die Set



Danly precision makes every Danly Die Set a reliable base for the finest die work. They save time in the die shop because they are square and true . . . they assure longer production runs in the press because precision closure protects die components.

Standard Danly Die Sets are quickly available from a nationwide system of completely stocked assembly branches. Just phone for fast delivery, and for the finest in die set precision, always specify Danly.

**DANLY MACHINE SPECIALTIES, INC.**  
2100 South 52nd Avenue Chicago 36, Illinois



*Another Transfer-matic by Cross*



## **Drills, Bores and Taps** *Automatic Transmission* *Extensions*

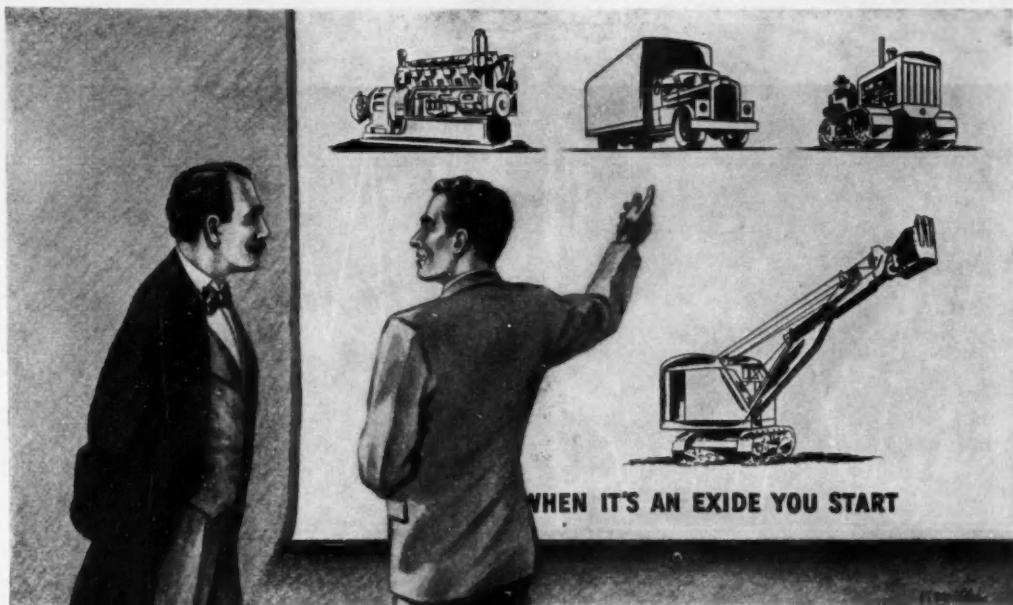


- ★ 85 pieces per hour at 100% efficiency.
- ★ 12 stations including one for loading, ten for cutting, and one for unloading.
- ★ Two position, progressive type, palletized work holding fixtures.
- ★ Integral conveyor automatically returns palletized fixtures from unloading to loading station.
- ★ Toolometers control tool life and stop machine when tools need sharpening.
- ★ Preset tools speed tool changing and eliminate machine adjustments.

**CROSS**

DETROIT 7, MICHIGAN

*Special* MACHINE TOOLS



When an **Exide** does  
the cranking, Mr. Diesel,  
your engine **STARTS**

**Y**ou can count on sure starting, because an Exide Battery is built specifically for the job . . . built to deliver the mighty surge of cranking power a Diesel engine needs. Whether you're a manufacturer or operator of Diesel engines and Diesel-powered equipment, that means you can depend on your Exide Diesel Cranking Batteries for:

- high maintained voltage—a *quick breakaway* and *high cranking speeds*.

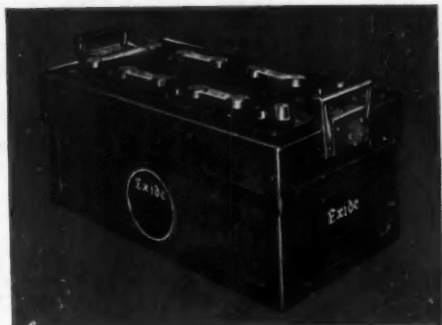
You also get:

- long life—low depreciation, less frequent replacements.
- low costs—operating, maintenance, repair.
- rugged construction, for heavy-duty service in all climates.

For maximum economy and dependability, use Exide Batteries for all your Diesel cranking—buses, trucks, trailer-tractors, off-the-highway equipment, ships, power plants, Diesel-electric locomotives.

**TO HELP YOU GET TOP CRANKING** performance, Exide's Engineering Staff, the largest in the industry, will be glad to help you solve any of your Diesel-cranking problems.

AUTOMOTIVE INDUSTRIES, May 1, 1950



THE ELECTRIC STORAGE BATTERY COMPANY  
Philadelphia 32

Exide Batteries of Canada, Limited, Toronto

"Exide" Reg. Trade-mark U.S. Pat. Off.

1888 . . . **DEPENDABLE BATTERIES** FOR 62 YEARS . . . 1950



## Statistical and Metallurgical Control Govern Quality of Eaton Valve Lifters

Eaton has developed outstanding facilities for the manufacture of valve lifters and associated parts.

Statistical Control of key operations provides a visual record of adherence to established limits.

The development of specialized types of chilled irons, and highly precise methods of metallurgical control, are important factors in Eaton quality.

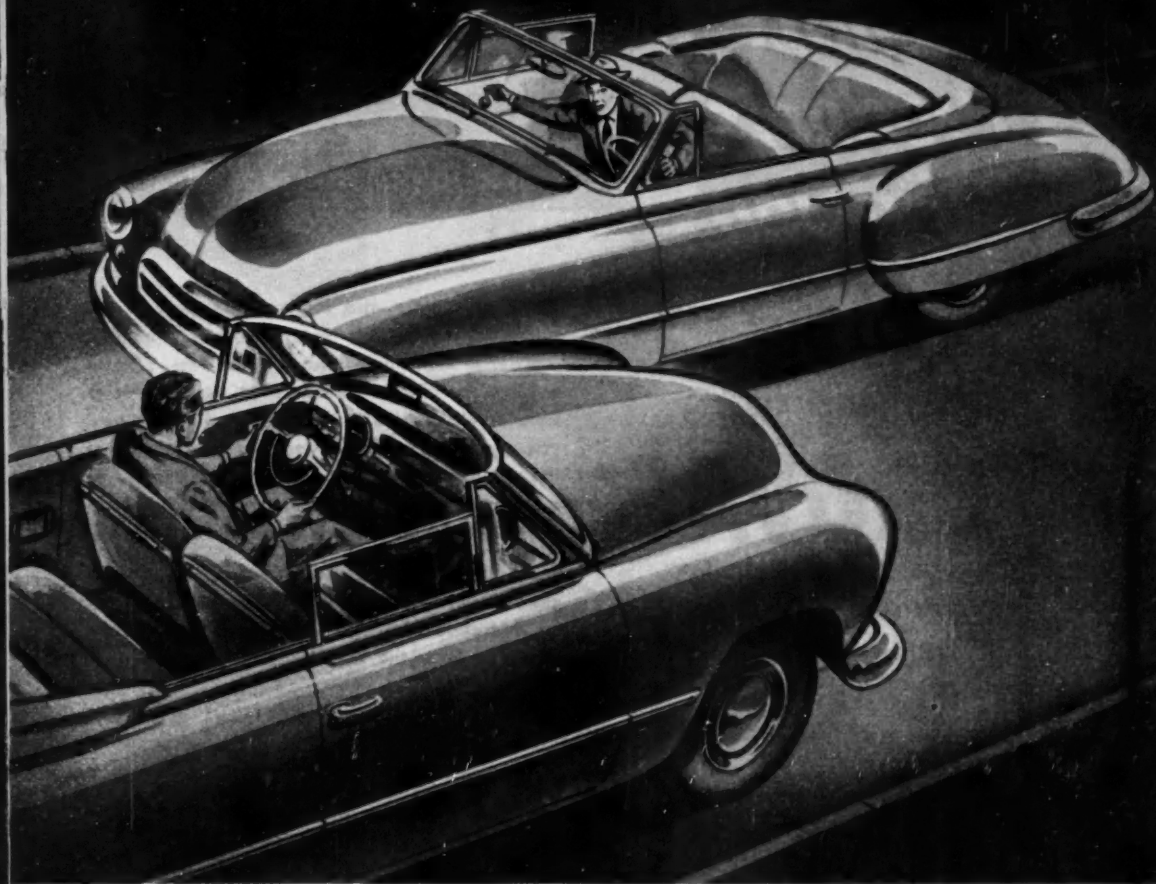


**EATON MANUFACTURING COMPANY**  
CLEVELAND, OHIO

VALVE DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

**EATON PRODUCTS:** Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings • Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers





## A Convenience? Yes—And Safer, too!

*That's why Hydro-Lectric Window Lifts  
are "Sales Clinchers" for Many Cars*

Car dealers everywhere welcome the Hydro-Lectric automatic window lifts. These units add sizeable profits on their own account and—they help to close many new car sales.

The motoring public has been quick to accept the convenience of automatic window lifts and to approve enthusiastically the increased safety which they contribute to everyday driving. The driver controls all windows with push buttons located within finger reach—he doesn't have to divert his attention from the road to open or close windows.

These features—as well as the dependability of Hydro-Lectric controls—have been proved on hundreds of thousands of automobiles over a period of many years.

★ ★ ★

*Hydro-Lectric Top, Window, and Seat Control Systems  
Convertible Tops • Automobile Body Hardware  
Manual Window Regulators • Window Glass Channels  
Power Take-Offs • Contract Production Parts  
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GEARED TO QUANTITY PRODUCTION

TAKE ADVANTAGE OF  
THE TREND TO

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THE WORLD'S FASTEST SELLING  
POWER BRAKE

Every day more and more commercial vehicle operators are turning to Hydrovac\* as the final answer to their power braking problems. This unrivalled preference presents to manufacturers, whose vehicles are factory equipped with Hydrovac, a pre-sold market of vast proportions. Further, the millions of Hydrovac units in daily use furnish a potential service and replacement business that any alert dealer organization would welcome.

There is an added sales feature for the commercial vehicle manufacturer who standardizes on Hydrovac—the best proven and most popular power brake in the world.

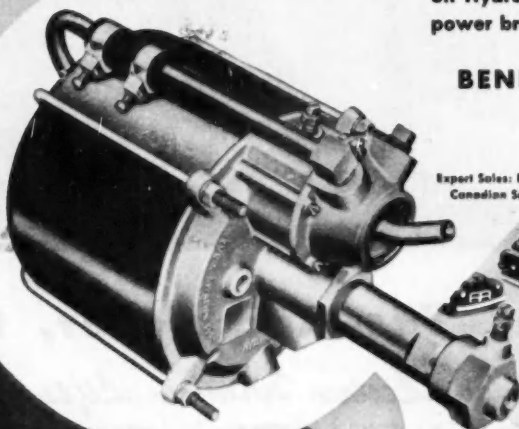
\*REG. U. S. PAT. OFF.

BENDIX • PRODUCTS • SOUTH BEND



AVIATION CORPORATION

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Canadian Sales: Bendix-Scipco of Canada, Ltd., Windsor, Ontario, Canada



BUILDERS  
OF THE BASICS  
OF BETTER  
MOTOR VEHICLES



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Reg. U. S. Pat. Off.

AUTOMOTIVE INDUSTRIES, May 1, 1950

## High Spots of This Issue

### ★ What's New at Indianapolis This Year

More entries than ever before are expected at the famous annual 500-mile racing event to be held at Indianapolis on Memorial Day. Ten new cars at least have been built for the occasion. One rear-engined car is also expected to compete. The interesting details appear on page 30.

### ★ Aircooled Two-Stroke Diesel Engine

Only recently described in the foreign technical press is a unique Diesel engine design developed in Vienna during the war for tanks and armored vehicles. Actual engines and drawings are thought to have been lost or destroyed during combat. Therefore data for this unusual article have had to be supplied from the personal notes of its designer, Dr. Karde of the Austrian-Sauer Corp. Page 34.

### ★ Exacting Machining Standards for Powerglide Transmission

This second production article in the Chevrolet automatic transmission series explains the extensive mechanization and automaticity found in the Cleveland plant. It emphasizes the close control of dimensional tolerances and fine finishes at high production rates that result. Page 42.

### ★ Quick Inspection Method for Engine Parts

A new general purpose process for detecting surface cracks by means of a dye penetrant developed at the Turbodyne Corp. is described and illustrated in this account by the company's chief metallurgist. This useful data is presented, starting on page 46.

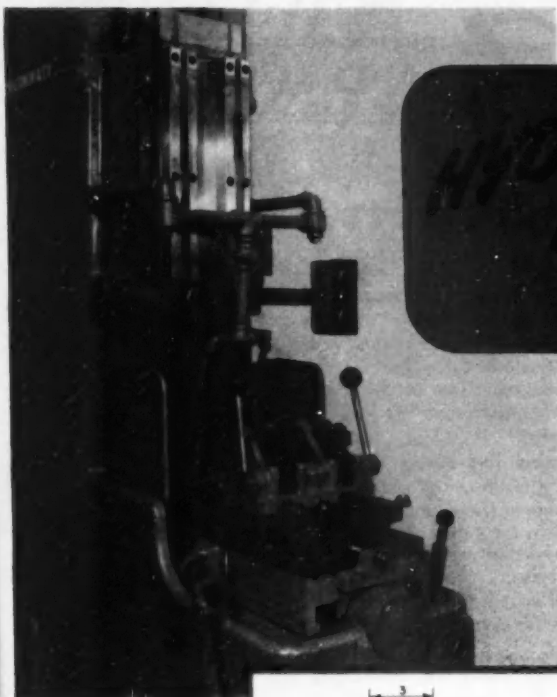
### ★ Expediting Production of Bearings

The Aetna Ball & Roller Bearing Co. of Chicago, producer of clutch release bearings for motor vehicles of all kinds, is widening its field of precision bearing products, even including making of parts of automatic transmissions. How newly purchased special machinery of advanced type is admirably fitting into this expansion picture makes informative reading, beginning page 48.

### ★ 20 New Product Items And Other High Spots, Such As:

Rounds rear engined racer rebuilt; faster inspection of connecting rods; the increasing use of pneumatic tools in automobile production; new welding developments discussed at the AIEE Conference; and the automotive production methods featured at the ASTE Annual Meeting.

*News of the Automotive Industries, Page 17  
For Complete Table of Contents, See Page 3*



## 3/8" DEEP SLOTS FROM THE SOLID

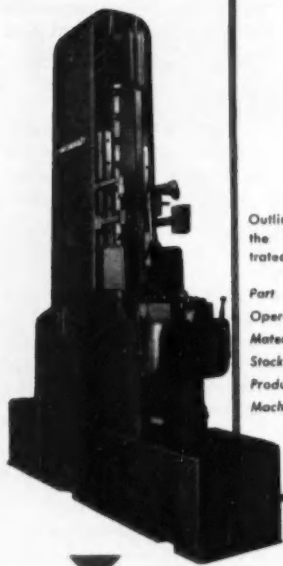
When can heavy stock be broached away at a lower cost than other methods of machining? Our Application Engineers know the answer to this question, for they have handled many heavy stock removal jobs, both low production and high production. In the example here  $\frac{3}{8}$ " deep bottle-shaped slots,  $\frac{1}{4}$ " wide at the top, are broached in operating shaft levers at a rate of 260 per hour. ¶ A simple hand clamping fixture, mounted on a CINCINNATI No. 3-48 Single Ram Vertical Hydro-Broach, holds two parts. Two rows of broaching cutters (inserts) broach two parts at the same time, holding close accuracy of width, depth and central location of the slot. Preset Cycle Control, an exclusive Cincinnati feature, simplifies operation and improves safety of the setup. The ram does not descend through its cutting stroke until the operator touches the cycle start buttons—both hands are out of the way. ¶ CINCINNATI Hydro-Broach Machines offer many advantages for low-cost surface broaching operations in your shop. You can tool them up yourself, or if you prefer, our Application Engineers are ready to lend a hand. May we hear from you?

THE CINCINNATI MILLING MACHINE CO.  
CINCINNATI 9, OHIO



Outline of slot broached from the solid on the CINCINNATI Hydro-Broach Machine illustrated here.

Part name.....	Operating shaft lever
Operation.....	Broach slot
Material.....	Steel forging
Stock removal.....	From solid
Production.....	260 per hour
Machine.....	CINCINNATI No. 3-48 Single Ram Vertical Hydro-Broach



CINCINNATI No. 3-48 Single Ram Vertical Hydro-Broach Machine. Seven sizes are available, up to 10-ton broaching force, 66" stroke. Write for catalog No. M-1389-2.

# Cincinnati

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES  
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



# News of the AUTOMOTIVE INDUSTRIES

Vol. 102, No. 9

May 1, 1950

## Chrysler Ordering Tools for New V-8 Engine

It has now been definitely confirmed that Chrysler has committed itself for a large investment in tooling for a new V-8 overhead valve engine. Original schedules called for production this year, and there is no evidence that the timetable has been upset materially by the strike. Machine tool builders have been able to go ahead with their commitments, and engineering personnel have not been affected by the strike, so that the development work undoubtedly could go on pretty much unhampered.

Corp. The officers of the organization are: Frank R. Pierce, president; B. A. Best, vice president and treasurer; A. N. Willis, vice president and general manager; and Clifton G. Hassberger, secretary. The services of this new organization will be available to farmers and other customers and to Dearborn distributors and their dealers for equipment purchases.

## GMC Truck Shuffles Staff for Intensive Drive

Keep an eye on GMC Truck during the next year. A quiet but thorough

than the previous record set in August, 1948. Look for some overhauling of sales techniques and aggressive and hard hitting sales campaigns.

## Studebaker Automatic Drive Priced at \$201.25

The price of the Studebaker automatic drive has been set at \$201.25. Studebaker is now shipping its Land Cruiser and Commander models equipped with the new transmission, which will be available on the Champion late this year.

## Federal Motor Truck Readies New Model

Federal Motor Truck Co. will offer new models in its medium heavy duty line next month. Details are still confidential. Five of the new models are currently undergoing rigorous tests.

## Hold First All-British Car Show in New York City

Nearly 100 automobiles were exhibited at the British Automobile and Motor Cycle Show which was held in New York City from April 15-23. Said to be the first all-British automobile show ever held in the United States, it was sponsored by the Society of Motor Manufacturers and Traders. A total of 22 makes of cars were represented, together with trucks; a double-decked bus, with observation dome; low and high horsepower Diesel engines for automotive, marine and stationary use; 50 models of motor cycles and bicycles and various automotive accessories. Also on display were a number of special exhibits such as the world's first gas turbine car (the so-called "turbo-jet"); the Jaguar XK120, reportedly the world's fastest stock car; Field Marshal Montgomery's "Old Faithful," a Humber car, from which he directed the African campaign; and other famous racers and historic vehicles.

## Vehicle Sales and Output Hit New Highs

Each succeeding month's report from manufacturers on production and retail sales gets more optimistic. Following are some of the reports on retail sales:



## TURBINE FOR TRUCKS

What is said to be the world's first gas turbine powered truck and its compact engine are shown here. Mounted in a 10-ton Kenworth Motor Truck Corp. chassis, with a 35-ft trailer attached, the new engine has been undergoing road service tests near Seattle. The 200-lb Boeing engine develops a normal 175 hp, and burns kerosene, Diesel oil or gasoline.

It now looks as though the V-8 will be used in the Chrysler line when new models are introduced.

## Dearborn Motors Forms a Financing Subsidiary

To assist in financing wholesale and retail purchases of Ford tractors and Dearborn farm equipment, Dearborn Motors, Detroit, has organized a financing subsidiary, Dearborn Motors Credit

reorganization of the entire organization has been underway for several months, including the appointment of Roger M. Kyes as general manager. He was previously assistant to the general manager and has a reputation as an aggressive administrator. Since he joined GMC last fall, he has shaken up and revitalized the organization with results that already are beginning to show. During March, the division had its largest truck production month in history with 11,161 units, or 1767 more



# News of the AUTOMOTIVE



## CONTROL FROM THE SEAT

The new John Deere No. 65 pull-type 12-ft combine is equipped with a 56-hp Hercules engine which is mounted on top. Designed for one man operation, the combine can be controlled from the tractor seat. The 45-bushel grain tank can be emptied standing still or on the go, it is stated, in 1½ minutes or less.

**Ford**—Truck sales during March highest in the 47-year history of the company and cars at a new high for any month since June, 1930. Combined car and truck sales for the first quarter the highest for any similar period since Ford's biggest year of 1924, and combined car and truck March sales at a new high since May, 1930. **Buick**—First ten days of April, retail sales 73 per cent ahead of the same period last year with 16,351 reported. March sales were at a new high with 54,993 new cars sold, first time in history that Buick passed the 50,000 mark. **Mercury**—Three records broken during March—biggest ten days sales period, biggest month, and biggest quarter. During the last ten days of the month, sales totaled 12,205 units, 85 per cent ahead of the same period last year and 34 per cent greater than for any other similar period in history. Sales for the month hit 29,950 cars, while, during the first quarter, Mercury sold 72,181 units. **Oldsmobile**—The 10,312 cars sold during the first ten days of April marked the gain of 61 per cent over the same period of 1949 and brought total sales this year through April 10 to 104,145 or 62½ per cent ahead of the same period a year ago. **Studebaker**—March retail sales 21 per cent ahead of February, the best previous month, and 83 per cent ahead of March, 1949. First quarter sales largest in history and 82½ per cent ahead of the first quarter of last year. **Nash**—Retail sales at an all-time high for March, totaling 34 per cent ahead of the same month a year ago. **Chevrolet**—Retail sales of 51,463 cars and trucks during first ten days of April, or 51.9 per cent ahead of the same period

a year ago and higher than the first ten days of March, which was the highest month in retail sales in Chevrolet history with 163,406 units.

Actually sales appear to be outrunning production with waiting periods for most popular makes again in effect. It is estimated that the industry without Chrysler has been producing at the rate of 6.4 million cars and trucks a year, which even tops last year's record-breaking performance. With Chrysler back in the picture, weekly

production should go up sharply this month and estimates of 175,000 to 180,000 cars and trucks a week are being forecast. How long the torrid sales and production pace can be maintained is an open question at the moment, but it is generally believed that it will hold until about mid-summer at least, with a tapering off in late July or August when some new model changeovers will be forthcoming.

## Nash Rambler Priced Under Big Three

Nash has come through on its promises to undersell the Big Three on its Rambler line, at least so far as the convertible model, first to be announced, is concerned. Factory delivered price is \$1808, which includes as standard equipment several deluxe items such as radio, heater, directional signals, foam sponge rubber cushions, courtesy lights and other similar equipment. The price compares with \$1847 for the Chevrolet without extra equipment. Other comparable convertible models prices are the Plymouth at \$1982, Studebaker Champion at \$1981, and Ford V-8 at \$1949. Whether or not the price differential can be maintained between the Rambler and others of the Big Three, particularly Chevrolet, in the large volume line such as two-doors, four-doors and sedans remains to be seen. Convertibles are definitely a specialty line with all manufacturers, and the disparity in manufacturing costs between large and small companies is not so



Wide World

## SPRING TO FALL

Shown at the Leipzig Spring Fair in Germany, this IFA (Vereinigung Volkseigener Fahrzeugwerke), convertible is powered by a three-cyl, 28-hp engine. The car, which may be in production by September, will be largely exported for an estimated price of \$1100 to \$1200.

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great as it would be in the large volume models.

## SAE Presents Wright Medal During Aircraft Meeting

Hundreds of aeronautical engineers attended the National Aeronautic Meeting of the Society of Automotive Engineers, held in New York City from April 17 to 20, which included about 30 exhibitors at the Aircraft Engineering Display held concurrently. During this meeting, the SAE 1949 Wright Brothers Medal was presented to Homer J. Wood and Frederick Dallenbach, both of AiResearch Manufacturing Co., Los Angeles, Calif. The presentation recognized the excellence of the technical paper, "Auxiliary Gas Turbines for Pneumatic Power in Aircraft Applications," written jointly by the two engineers. Outstanding aeronautical engineers reviewed the achievements of the Wright Brothers at the presentation session, and the principal speaker was M. P. Baker, of GM's Inland Mfg. Div., who has had access to the papers of Orville and Wilbur Wright, assisted by a panel composed of Francis Clauser, of Johns Hopkins University; Alexander Kartveli, of Republic Aviation Corp.; and Opie Chenoweth, of the U. S. Air Force Powerplant Laboratory. Sessions were devoted to an engineering study of the air transport problems of the 1955-1965 period, with emphasis on the probable utilization of turbojet and turboprop powerplants. Relationship between the future jet transports and military requirements was considered at a session by Major General Laurence S. Kuter, USAF Commander, Military Air Transport Services. Engineers inspected the Idlewild International Airport, where the Canadian A. V. Roe C-102 Jetliner made its American debut, and flight demonstrations were made by the American Grumman F-9-F, Republic F-84, and other jet-propelled aircraft.

## Ford of Canada Set New Records in 1949

In the "greatest year in our history," Rhys M. Sale, president of the Ford Motor Co. of Canada, announced that his company had smashed all previous records for sales, profits, and production in 1949. In the annual report to shareholders, Mr. Sale revealed that net profits climbed 116 per cent last year—from 1948's \$7,969,534, to \$17,256,762. Ford of Canada sales jumped to \$212,036,601, compared with \$168,288,888 in 1948 and an average annual figure of \$83,173,018 in the 20-year period 1929-1948. Largest maker of cars and trucks in Canada, Ford last year turned out a record 112,130 vehicles, compared with



## THREE ON THE 3000

This newly-designed White 3000 tank truck for the petroleum industry, with 35 per cent more capacity, is the result of three-way collaboration between the Standard Oil Co. of Ohio, Pennsylvania Furnace and Iron Co., and the White Motor Co. The truck has a capacity of 3800 gal. and a saving in overall length of 2½ ft. Hose and reel for deliveries were placed on the side.

97,015 in 1948 and the previous peacetime peak of 101,185 in 1947.

More motor cars and trucks were built by Ford Motor Co. of Canada during March, 1950, than in any other month since March, 1929. Output totaled 12,546 vehicles, including 8155 automobiles, 2903 trucks, for domestic use and 1488 vehicles for export. The March, 1929, output was 12,629 vehicles.

## Kaiser-Frazer 1949 Loss Exceeds \$30 Million

After taking a loss of \$30,329,351 in 1949, Kaiser-Frazer is looking ahead with considerable optimism to its new and much more complete line of cars to put it back as a strong contender in the automobile business this year. A large part of the loss is accounted for by tooling cost for the three lines of cars which K-F will offer to the public this year. The Frazer is already on the market and the Kaiser will be announced about the 10th of May with the smaller car to be brought out in June. Of the \$10 million authorized for K-F Sales Corp. for financing inventories of new cars \$2,314,030 had been used, and \$20,492,928 of the \$34.4 million credit for tooling new models was outstanding at year end. The latter figure breaks down to \$8,492,928 for bringing out the three new models and \$12 million for working capital. An interesting statement in connection with the report is that the national distributor and dealer organization now numbers 2600, indicating a drastic pruning operation, since K-F at one time had more than 4200 dealers. The dealer organization has been undergoing a thorough shake-up and strengthening process during the past year.

## International Has New Line of Multi-Stop Trucks

Featuring all-new, matched chassis and bodies, a new line of International multi-stop delivery trucks with Metro bodies has been announced by International Harvester Co.'s motor truck division. The new line includes three body sizes. The 7½-ft body, with 235-cu ft capacity, is available on three 102-in.-wheelbase chassis: the LM-120, with a 5300-lb GVW; the LM-121, with a 5800-lb GVW; and the LM-122, with a 6300-lb GVW. The 9½ ft body, with 292-cu ft capacity, is available on six 115-in.-wheelbase chassis: the LM-120, with a 5300-lb GVW; the LM-121, with a 5800-lb GVW; the LM-122, with a 6300-lb GVW; the LM-150, with an 8000-lb GVW; the LM-151, with a 9000-lb GVW; and the LM-152, with a 10,000-lb GVW. The 12-ft body, with 375-cu-ft capacity, is available on three 134-in.-wheelbase chassis: the LM-150, with an 8000-lb GVW; the LM-151, with a 9000-lb GVW; and the LM-152, with a 10,000-lb GVW. The line is powered by the new International Silver Diamond 220 six-cyl, 100-hp truck engine. The company is now producing the chassis as well as the body in one plant, which has required the addition of 42,000 sq ft of manufacturing space in the Bridgeport, Conn., works for chassis line.

## American Bantam Plant to be Sold for Taxes

The American Bantam Car Co. at Butler, Pa., will be sold to satisfy government tax claims totaling more than \$337,000. Originally, the company pro-

# News of the AUTOMOTIVE



Continued Photos

## NO LONGER A SECRET

Just released from the secret list, this is Britain's new super tank, the 50-ton Centurion, which is powered by a Meteor gasoline engine developing 635 hp. The tank was designed by the Ministry of Supply Fighting Vehicles Establishment in conjunction with Vickers-Armstrong, Ltd.

duced small automobiles, but in recent years has manufactured farm machinery.

## Flader Producing New Small Jet Engine

Fredric Flader Inc., North Tonawanda, N. Y., now has a backlog of work almost at the \$2.5 million mark, an all-time peak for the six-year-old company. President Fredric Flader said that his company is about ready to start delivery of small jet engines that will be used to power guided missiles and pilotless aircraft. Said to be the smallest of all jets, these weigh only 300 lb. It is reported that U. S. Air Force contracts which have covered development of this new jet by Flader and call for delivery of 60 of them, amount to about \$1,250,000. The new jet is only 16 in. in diameter and 60 in. long, but it has a 700-lb thrust. "The new jet incorporates features we consider to be the most revolutionary since the original jet engine," says Mr. Flader.

## Eckert of Sun Oil to Get 1950 Parlin Award

Samuel B. Eckert, Sun Oil Co. vice-president in charge of marketing, will receive the 1950 Parlin Memorial Award for "outstanding contribution to the field of marketing," it has been

announced by the American Marketing Association. Mr. Eckert will accept the award in Philadelphia on May 16, when he is scheduled to deliver the annual Parlin Memorial Lecture. The award was made in recognition of the marketing contribution Mr. Eckert has made in the petroleum industry through his leadership in the development of the marketing facilities and marketing policies of the Sun Oil Co.

## Hudson Making First Postwar Canadian Models

Hudson Motors of Canada Ltd. is producing its first Canadian-made cars since the war, through facilities of Chatco Steel Products Ltd. at Tilbury, Ont. The first cars, 1950 Pacemakers, came off the assembly line at ceremonies attended by government officials.

## Reo Makes First Profit Since June of 1948

Further indication that the truck business is snapping back after a severe drop off last year is seen in the report that Reo Motors, Inc., in the first quarter of this year made a profit, the first since the second quarter of 1948. The improved showing was made without benefit of military orders. Earnings for the quarter were \$50,386 after federal taxes of \$37,000, which compares with

a net loss of \$204,004 for the same period a year ago. March orders for the trucks equipped with the new overhead valve engine which Reo introduced last year were up 39 per cent over a year ago, according to Joseph S. Sherer, Jr., president. He also revealed that production will start in May on an Army order for approximately 5000 2½-ton 6 by 6 trucks. The order totals more than \$30 million.

## Chrysler Making Progress on Automatic Drive

Little is known officially about the progress Chrysler is making with a fully automatic transmission, but there is evidence that development has proceeded far enough to take initial steps toward getting into production of such a unit. Certain machinery has been ordered for producing an automatic transmission, but the stipulated delivery date is not known, nor is there any indication of whether the full tooling program has been approved. However, a start has been made which indicates at least part of the design has been set. It is understood that the unit will be of the torque converter type. Another automobile company also has an interesting development underway in connection with an automatic transmission, and an announcement should be forthcoming in another 60 days or so.

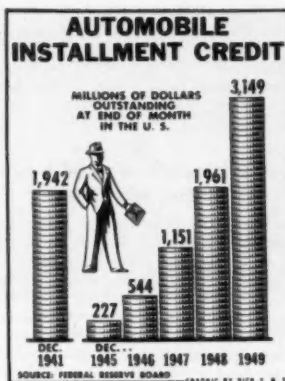
## Four Key Officials Quit Twin Coach Company

Four top officials have resigned from Twin Coach Co. in a general reorganization being carried on for reasons of economy and coordination of top personnel. Those resigning are Herman Fagert, vice president in charge of production; Walter E. Boyce, general superintendent of production; L. A. Anderson, director of purchases; and H. W. Geisinger, cost accounting official.

## To Hold Mat's Handling Show in Chicago in 1951

The Fourth National Materials Handling Exposition will be held in Chicago from April 30 to May 4, 1951. The Material Handling Institute will sponsor the exposition, and concurrently with the show, a conference will be conducted with nationally-known experts leading discussions on new techniques in materials handling and related fields, to be developed by the American Materials Handling Society. The combined indoor and outdoor exposition will cover 10 acres of machinery exhibits, and there will be six acres of handling equipment indoors,

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and an additional four acres in the adjacent outdoor area. Several hundred manufacturers of materials handling equipment with thousands of models will provide what is described as the most extensive display of cost reducing machinery in operation ever assembled.

## Innocenti of Italy to Make New Utility Car

The Innocenti Co. of Milan, Italy, is making arrangements to start the output of an utility car with four seats. The frame is of the tubular type, and orders are expected especially from the Middle East, Pakistan, India, and Indonesia. The Mercedes Benz Co. is negotiating an agreement with Alfa Romeo to develop the manufacture of this type of German car in the Milan works of Alfa Romeo.

## Navy Awards Top Civilian Honor to Hyland of Bendix

The U. S. Navy recently conferred its highest civilian honor, the Distinguished Public Service Award, upon Lawrence A. Hyland, vice-president of Bendix Aviation Corp. in charge of engineering research, for making the first practical application of radar to the detection of aircraft.

## Ferry Elected Treasurer and Director of AMA

Hugh J. Ferry, president and treasurer of Packard, has been elected treasurer and board member of the Automobile Manufacturers Association. He fills the two posts vacated when George T. Christopher, former Packard president, retired at the end of last year.

## Tool Engineers Elect New Officers

Herbert L. Tigges, vice president, Baker Bros., Toledo, was elected to the presidency of the American Society of Tool Engineers, at the 18th annual convention in Philadelphia. Succeeding Mr. Tigges as first vice president of the ASTE is J. J. Demuth, methods engineer and general superintendent, Sligo Iron Works, St. Louis, Mo. H. E. Collins, engineer with Hughes Tool Co., Houston, Tex., was elected second vice president, and Roger F. Waindle of Elgin National Watch Co., Aurora, Ill., was named third vice president. W. B. McClellan, Gairing Tool Co., Detroit, and George A. Goodwin, chief tool engineer, Standard Electric Co., Dayton, O., were reelected national secretary and treasurer, respectively. H. E. Conrad is executive secretary of the technical society. Elected to the board of directors were the following: H. L. Tigges; L. B. Bellamy, Sterling Grinding Wheel Co., Detroit; Jos. T. Crosby, vice president, Lapointe Machine Tool Co., Hudson, Mass.; J. J. Demuth; T. J. Donovan, Jr., president, T. J. Donovan Co., Philadelphia; R. B. Douglas, president, Godscroft Industries, Montreal; V. H. Ericson, president, Johnson De-Vou, Inc., Worcester, Mass.; E. W. Ernst superintendent of punching, Tool & Die Div., General Electric Co., Schenectady, N. Y.; B. J. Hazewinkel of the L. S. Starrett Co., Denver; A. D. Lewis, manager, Art Lewis Production Equipment Co., Glendale, Calif.; and Fred J. Schmitt, director, D. A. Stuart Oil Co., Ltd., Chicago.

The setting up of a research foundation to carry on basic production research was also authorized by the ASTE and an initial fund of \$25,000 was appropriated at the same time. New York City was selected as the site for its next annual convention in March, 1951, and the next industrial exposition to be held by the technical society is scheduled for the week of March 17, 1952, in Chicago.

## Packard to Double Outlay for Tools and Equipment

Disclosure by Packard that it expects to spend nearly \$19 million for plant, machinery, and tools this year indicates major development activity. It is known that Packard will bring out newly-styled models late this summer, but the amount of expenditure anticipated would indicate that there is something more than just a new model in the works. The rather high outlay this year may indicate work on a new engine program for next year.

## Trucks to be Produced in K-F Israel Plant

It is understood that production of an American truck will be included in operations of the Kaiser-Frazer assembly plant in Israel later this year. K-F has an investment of \$500,000 in the company, K-F of Israel, Ltd., which has a total capitalization of \$2.5 million. Production has been scheduled to begin in August on a one-shift operation in a plant at Haifa which has an area of



Wide World

## GETS A LIFT

Exhibited at a show held recently in Muenster, Germany, this farm tractor, equipped with a 15-hp engine, features a special device which enables the driver to lift the front wheels on uneven ground. Built by the Alpeland Motor Co., Wolfratshausen, Upper Bavaria, Germany, it sells for about \$1550.



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115,000 sq ft, and which will have capacity of 6000 cars a year. Assembly equipment is being rushed from this country and a plant manager and technical supervisory personnel are being sent from Willow Run to train the 300 persons required to man the plant.

## Sweden Reduces Automotive Import Duty

United States tariff concessions, initially negotiated with Sweden at Anney, France, in 1949, became effective April 30, 1950. Among the most important concessions granted by Sweden are duty reductions on automobiles and parts for assembly. The ad valorem duties on passenger automobiles (other than motor buses) of the types in which the United States has the chief interest, and on automobile and truck chassis, were reduced from 20 per cent to 15 per cent. The rate of duty on automobile parts and tires for assembly was reduced from 15 per cent to 12 per cent ad valorem, while the rate for automobile parts for replacement was bound at 15 per cent. Sweden also reduced the duty on certain agricultural implements and bound the duty on tractors.

## Vauxhall Effecting \$65 Million Modernization Program

Using 4300 tons of structural steel originally intended for a new factory

in the United States, the Vauxhall (General Motors) factory at Luton, England, is in the process of complete rebuilding and modernizing at a cost of about \$65 million for buildings, site preparation, services and boiler house, this forming part of a \$280 million program spread over three years. The plans provide for the replacement of a considerable part of the present plant, the re-layout of all shops for improved production flow, less fatigue and better working conditions, and the provision of specialized tools and jigs. The first building, nearly a third of a mile long, will increase the area of the Vauxhall factory (at present 2½ million sq ft) by a third, and is expected to produce an appreciable increase in the present annual output of 84,000 vehicles. Construction should be completed by mid-June, and production is expected to start in August.

The new building is all on one floor level except that stretching beneath one end is a reinforced concrete basement, 77,000 sq ft in area, which will be connected by two lifts with the ground floor. Above this is a two-story office block running the full width of the building and providing 26,400 sq ft. The western side of the building forms a stores bay 60 ft by 1700 ft with overhead cranes. This is served by a loading dock 120 ft by 35 ft.

The services of technical experts from the various GM plants in America have been secured, and Walter E. Hill,

from General Motors Overseas organization was placed in charge of forward planning last August. Vauxhall production last year was 84,167 vehicles. Exports were 75 per cent of the passenger cars and 61 per cent of commercial vehicles.

## GM of Canada to Build New \$3 Million Warehouse

A new \$3 million central parts distribution warehouse will be built by GM of Canada on a 4000-acre site on the southwestern outskirts of Oshawa, Ont., Canada, for occupancy late this year. The building will have seven acres of space under one roof. It will accommodate 500 employees now quartered in the existing parts department in Oshawa. Some 43 million pounds of replacement parts were shipped across Canada last year.

## Fisher Body to Expand Grand Rapids Plant

GM's Fisher Body Div. is expanding its Grand Rapids, Mich., plant to add 189,000 sq ft of floor space. The plant supplies stampings for automobile bodies.

## New Engine Programs Aid Machine Tool Industry

New engine programs in the automobile industry should provide a continuing market for special machines and production equipment. Ford has a tremendous tooling job ahead when it equips its two new projected engine plants scheduled for completion by a year from this fall. Chrysler and Studebaker also have new engines in the works.

## Gleason Works Celebrates 85th Anniversary

The Gleason Works, Rochester, N. Y., builders of bevel gear machinery, recently celebrated its 85th anniversary with an open house. The company's present modern plant in Rochester consists of about 500,000 sq ft of floor space and occupies nearly 24 acres.

## Experimental Martin Jet Using Variable Incidence Wing

The U. S. Air Force's second experimental Martin XB-51 made its first flight recently at Baltimore, Md. Featuring a swept-back variable incidence wing and other advanced design features, it is the Air Force's first post-war ground support bomber. The un-



## MOVING A MONSTER IN MONTREAL

Shown in transit from the Dominion Bridge Co.'s plant in the western part of Montreal, Canada, to the Shell Oil plant in the eastern part of Montreal, this is said to be the largest water softener sold in Canada. An Autocar Diesel truck was used to transport the unit which is 15 ft in diameter by 45 ft straight side. It was sold by Lewin's Ltd. of Montreal to Shell Oil.





## PLANE AND CRANE

Called the Flying Crane, Howard Hughes' XH-17, said to be world's largest helicopter, is shown being wheeled from Hughes plant in Culver City, Calif. The plane is powered by two turbo-jet engines, and will be reportedly used to lift and carry a small tank or big gun for short distances.

usual feature of a variable angle of attack wing enables the Martin XB-51 to take-off and land without assuming a nose-up attitude. The XB-51 is said to be the first bomber to use the variable incidence wing.

## Aro Equipment Has Product Exposition in New York

The Aro Equipment Corp., Bryan, O., recently gave the financial community in New York City a two-day showing of its products. Aro makes lubricating equipment, grease fittings, pneumatic tools, hydraulic pumps, and a variety of aircraft operational equipment. Opening what he termed a "one-company product exposition," Ralph W. Morrison, Aro Equipment vice-president, said that he and his associates had thought this would be a good way for industry and finance to get closer together in the interests of our country's economic progress.

## Packard Stockholders Keep All Officials

Stockholders of the Packard Motor Car Co. have reelected all officers and directors for the coming year. Hugh J. Ferry, president, told stockholders that the company is in excellent shape and that business will pick up following a slight dropping off in its business. He stated the company is operating on a four-day week with production geared to sales.

## New K-F Assembly Plant Started on West Coast

Construction has started on a \$350,000 Kaiser-Frazer assembly plant at Portland, Ore., being built by Union Pacific Co. for lease to K-F. It is to

be completed in about four months and will have a capacity of 20 cars a day. It is the first of several planned by K-F throughout the country. Components will be shipped from Willow Run, but the plants will require a considerable investment in assembly equipment such as conveyor lines and other materials handling equipment.

## Gar Wood Expansion to Cost \$350,000

Gar Wood Industries, Inc., has started a \$350,000 expansion at its Wayne Div. The program includes a new machine layout and added facilities for steel

storage and manufacturing. The company also has announced price cuts from six to eight per cent on winches, cranes, pole derricks, garage wreckers, power takeoffs, and drive parts.

## GM Offers to Buy Union Headquarters

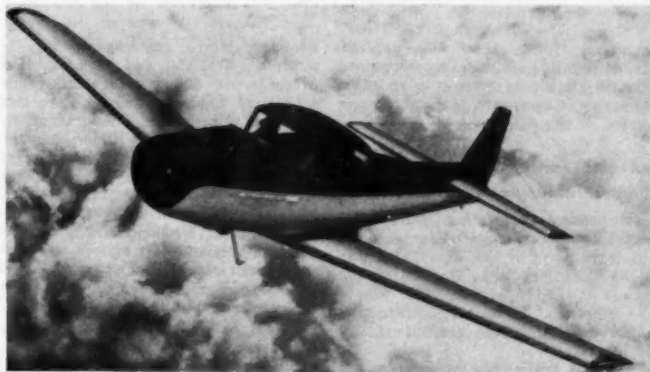
GM has taken an option to buy the UAW-CIO headquarters in Detroit when the union moves out to its new \$1 million building now under construction in eastern Detroit. The present union headquarters, next to the GM building, is a three-story building purchased from GM in 1942. GM has not indicated what it would use the building for.

## Harry Ferguson Reports Loss for Last Year

Harry Ferguson, Inc., has reported a net loss of \$368,251 for 1949. The loss is after a federal income tax carry-back refund of \$170,000.

## Morrison Made Assistant to K-F President

William G. Morrison has been promoted by Kaiser-Frazer from assistant director of sales to executive assistant to Edgar F. Kaiser, president. He will advise in the formulation of corporate sales policies in his new post. Before joining K-F in 1946, he spent 25 years in the automobile sales field with Chalmers, Maxwell, and Chrysler.



## FAST CLIMBER

This is an artist's sketch of the new 1950 Ryan Navion Super 260. Performance figures announced for this 260-hp model include a 170 mph cruising speed, and 1250 fpm rate of climb. Its maximum range at economy cruise settings is 900 miles, and service ceiling is 18,000 ft.

# News of the AUTOMOTIVE INDUSTRIES

## Military Orders Increase for Automotive Items

Military requirements of the armed services for automotive vehicles, spare parts, tools and equipment so far during the current fiscal year total more than \$160 million, and before June 30, end of the fiscal year will far exceed the \$185 million spent the preceding year. Contracts covering a large part of the requirements have already been let by Detroit Ordnance District, procurement agency for the three military services, and by June 30 commitments will exceed those of last year by a substantial margin, according to Ordnance officials. Much of the business is done with small firms, with about 40 per cent of the contracts going to companies

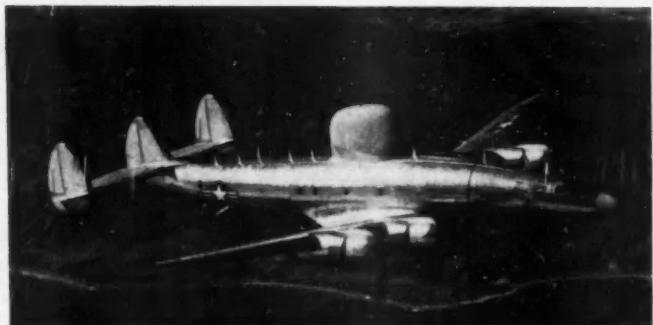
551; Biederman Motors Corp., Cincinnati, O., spare parts for truck tractors trailers and cranes, \$137,837; Champion Spark Plug Co., Toledo, O., spark plugs, R37S-1, \$201,875; Electric Storage Battery Co., Cleveland, O., batteries, aircraft storage, K-1, \$161,178; General Electric Co., Schenectady, N. Y., modification & overhaul of fuel regulators for J-47 engines, \$532,260, and for J-47 turbo-jet engines, spare parts tools and data, \$24,335,384; B. F. Goodrich Co., Akron, O., wheels & brakes spare parts, \$344,022; Goodyear Tire & Rubber Co., Akron, O., wheels and brakes, \$136,161; Hamilton Standard Propeller, United Aircraft Corp., E. Hartford, Conn., reports of various investigations—prop. blades & slip ring assy., \$298,545; Minneapolis-Honeywell Regulator Co., Min-

neapolis, in the amount of \$72,695 for development and production of special forgings. Other recent contracts include one to the Sperry Corp. for eight automatic pilots amounting to \$81,256 and another for 10,000 quarter-ton (Mark 65 Mod O) practice bombs, to be supplied by Lynch Bros., Inc., of Pine Meadow, Conn., for a total of \$122,400.

## Navy and Air Force Buying 2048 Airplanes

The U. S. Navy is purchasing 798 new aircraft with fiscal year 1950 aircraft procurement funds at a total estimated cost of \$557.5 million. The estimated cost for complete aircraft and spares is \$550.6 million and the remaining \$6.9 million will cover related items such as ground handling equipment not chargeable to specific models. The amounts indicated below represent contracts let to date for each model for both airframes and other aircraft equipment.

Model	Contracts Awarded (Millions of Dollars)	Airframe Manufacturers
F3D	\$61.7	Douglas Aircraft Co., Inc.
AD	12.1	Douglas Aircraft Co., Inc.
F9F	92.9	Grumman Aircraft Engr. Corp.
AF	41.3	Grumman Aircraft Engr. Corp.
P2V	36.7	Lockheed Aircraft Corp.
T0	1.3	Lockheed Aircraft Corp.
P5M	31.4	Glenn L. Martin Co.
F2H	68.6	McDonnell Aircraft Corp.
AJ	16.6	North American Aviation, Inc.
HUP	4.2	Piasecki Helicopter Corp.
F4U	9.1	United Aircraft Corp., Chance Vought Div.



LAB ON THE WING

This modified Lockheed Constellation is being used by the Navy as a flying laboratory to test powerful new radar equipment. The plane has two large radome humps, midway along the top and bottom of its fuselage, which house the radar antennae.

employing fewer than 500 persons. Standardization of military vehicles and parts is continuing further in an effort to reduce costs and to facilitate better service in the field.

## Armed Forces Announce New Automotive Contracts

Two contracts totaling nearly \$2.5 million have been awarded for automotive spare parts by the Army. One was to the Chrysler Corp., Detroit, in the amount of \$1,145, and the other was to the Firestone Industrial Production Co., Akron, O., in the amount of \$2,356,200.

The Air Force has announced the award of the following contracts: Beech Aircraft Corp., Wichita, Kans., modification kit—K-2 heaters, \$125,659; Bendix Products, Bendix Aviation Corp., South Bend, Ind., wheel & brake assys., spare parts, \$198,431, and \$307,-

neapolis, Minn., spare parts for C-1 autopilot, \$113,830, and for services of overseas and domestic technical representatives, \$132,071; Pioneer Parachute Co., Inc., Manchester, Conn., aerial delivery kits, \$238,876; Piper Aircraft Corp., Lock Haven, Pa., E-3 oxygen servicing trailer, \$109,967; Sperry Gyroscope Co., Sperry Corp., Great Neck, N. Y., C-5 directional gyro, \$462,556; Titeflex, Inc., Newark, N. J., maintenance & overhaul of magneto and ignition harnesses, \$149,030; and United Truck & Equipment Co., Baltimore, Md., cooler airborne type A-1, \$486,497.

The Navy has awarded the following contracts: Columbian Bronze Corp., Freeport, Long Island, New York, 24 propeller blade assemblies, \$139,440; and United Aircraft Corp., Hamilton Standard Div., E. Hartford, Conn., propeller assemblies, \$565,159, and \$485,712. The Navy has also entered into a contract with the Midvale Co. of Phila-

The U. S. Air Force is purchasing 1250 new aircraft from fiscal year 1950 aircraft procurement funds at a total estimated cost of \$1297.5 million. The estimated cost for complete aircraft and spares is \$1203.2 million. Additional aircraft procurement funds in the amount of \$94.3 million are being obligated for related items of equipment or service such as transportation, ground handling equipment, modification of existing types, and other costs to support the aircraft program which are not chargeable to the purchase of specific aircraft models.

Model	Estimated Cost of Complete Aircraft (Millions of Dollars)	Airframe Manufacturer
B-47	\$303.6	Boeing
C-97	32.8	Boeing
B-36	267.8	Consolidated Vultee
T-29	9.8	Consolidated Vultee
C-124	84.5	Douglas
C-119	40.6	Fairchild
SA-16	7.8	Grumman
F-94	120.0	Lockheed
T-33	26.9	Lockheed
P-88	34.4	North American
P-95	130.9	North American
T-28	15.6	North American
F-89	81.8	Northrop
H-21	9.2	Piasecki
F-84	37.4	Republic

# Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers.

**Niles-Bement-Pond Co.**—Alexander H. d'Arcambal, Vice-Pres., General Sales Manager and consulting Metallurgist of the company, has been elected a director. Edwin J. Schwanhauser, Exec. Vice-Pres. Worthington Pump and Machinery Corp., was also elected a Director.

**Pratt & Whitney Div., Niles-Bement-Pond Co.**—Vas L. Howe has been appointed Advertising Manager for the Division, also for the Chandler-Evans and Potter & Johnson Divisions of the company. Fred J. Dunne has been appointed to the newly created position of Asst. Advertising Manager.

**Norton Company**—Announcement has been made of the appointments of W. Earle Shumway as Manager, Sales Engineering Dept., Abrasive Div., and Fred L. Curtis as Sales Manager, Western Region.

**Wagner Electric Corp.**—A. H. Timmerman, Vice-Pres. and Director of the company, has announced his retirement. G. A. Waters, Vice-Pres. in charge of Manufacturing, was elected to fill the vacancy created by Mr. Timmerman's retirement. P. B. Postlethwaite has been elected Chairman of the Board and J. H. Devor will succeed him as President. H. N. Felton was elected vice-Pres. in charge of Sales; L. W. McBride was elected Asst. Secretary-Treasurer to succeed A. K. Bahret, who has retired.

**McQuay-Norris Mfg. Co.**—Arden J. Mummert was elected President, succeeding Arthur G. Drefs, who has become Chairman of the Board of Directors. W. K. Norris, founder of the company, was elected Honorary Chairman. Ballard A. Yates has been elected Vice-Pres., in charge of Manufacturing, and Charles C. Tapscott, Vice-President in charge of Sales Promotion.

**Acheson Colloids Corp.**—Appointment has been announced of Carl J. Parach as Advertising Manager.

**M. W. Kellogg Co.**—Warren L. Smith has been elected President, succeeding Harold R. Austin, who is retiring. Bennett Archambault, formerly Treasurer, was elected Vice-Pres. and General Mgr., a newly created post. G. Franklin Bayes and Ronald B. Smith were made Vice-Presidents. Daniel J. Olsen was elected Treasurer and Comptroller and Edwin L. Gidley, Secretary.

**The Cleveland Graphite Bronze Co.**—Henry W. Luetkemeyer, Chief Engineer, was elected Vice-President-Engineering, and Merrill A. Young was elected Vice-President-Personnel. Robert H. Daisley, a new Director, is Vice-Pres. and Director of Mfg., Eaton Mfg. Co.

**Allegheny-Ludlum Steel Corp.**—The appointment of E. H. Forsstrom, to the newly created position of Director of Training, has been announced.

**General Motors Corp.**—The election of Roger M. Kyes as Vice-Pres. of the corporation has been announced. Mr. Kyes recently became General Manager

of the GMC Truck and Coach Division of the corporation.

**Fisher Body Div., General Motors Corp.**—Walter A. Zielke has been appointed General Director of Production Control.

**Ford Div., Ford Motor Co.**—W. L. Cress has been made Asst. Car Sales Manager. Announcement of the appointment of John S. Snyder as Asst. Manager of Truck Sales in the Fleet Sales Dept., has been made. Donald C. Burdette has been made Mgr. of the Used Car and Truck Sales Dept.

**Lincoln-Mercury Div., Ford Motor Co.**—Appointment of key personnel for the new Central Parts Depot, now under construction, has been announced as follows: N. E. Lockhart has been named Asst. Parts and Accessories Mgr., charge of Warehouse Operations; J. K. Neeley, Depot Manager and Arthur Superko, Asst. Depot Manager. J. G. Burgin is Executive Accountant.

**Marmen-Herrington Co., Inc.**—George H. Freers has been made Vice-Pres. in charge of Engineering; Fred B. Croner, Vice-Pres. charge of Procurement.

**Ford Motor Co.**—Appointment of Peter J. Boldenow as Traffic Mgr., Pressed Steel Plant, Buffalo, has been announced.

**Kaiser-Frazer Corp.**—William G. Morrison has been made Executive Asst. in matters pertaining to sales, to President Edgar F. Kaiser.

**Delco Appliance Div., General Motors Corp.**—The appointment of John J. Carmichael as General Purchasing Agent, has been announced.

**A. Schrader's Son—Davis S. Hunter.** Advertising Manager, has announced his resignation.

**Consolidated-Vultee Aircraft Corp.**—J. V. Naish has been appointed Director of Sales. J. G. Zevely has been made manager of contracts, San Diego Div.

**Northrop Aircraft, Inc.**—Kenneth P. Bowen has been made Vice-Pres. in charge of Manufacturing and John W. Myers, Vice-Pres. in charge of Customer Relations, replacing C. N. Monson, resigned.

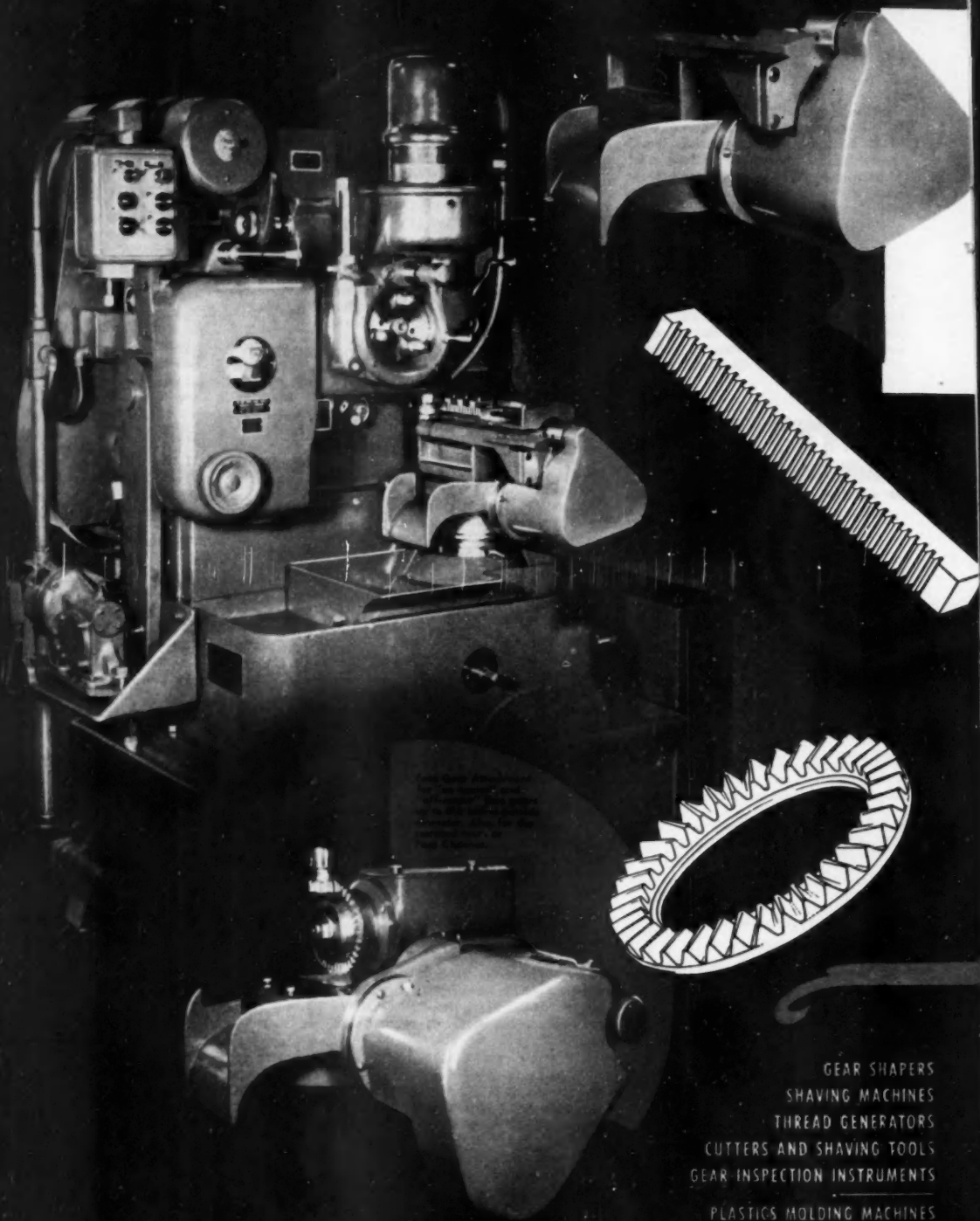
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## CALENDAR

### OF COMING SHOWS AND MEETINGS

#### Conventions and Meetings

Chamber of Commerce of the United States Annual Mtg., Washington, D. C.	May 1-3
International Motor Show, Turin, Italy	May 4-14
Mid West Automotive Show, Chicago	May 11-14
Automotive Engine Rebuilders Assoc. Annual Convention, St. Louis	May 18-19
Soc. for Exper. Stress Analysis, Cleveland	May 25-27
International Trade Fair, Toronto	May 29-June 9
Amer. Society for Quality Control, Fifth Midwest Conference-Annual Convention, Milwaukee, Wis.	June 1-2
Amer. Gear Mfrs. Assoc., Hot Springs, Va.	June 4-7
SAE Summer Mtg., French Lick	June 4-9
Amer. Electroplaters' Soc. Convention, Boston	June 12-16
Amer. Soc. Mech. Engineers, Nat'l Mtg., Chicago	June 12-16
Nat'l Truck, Trailer & Equip. Show, Los Angeles	June 22-25
A.S.T.M. Annual Mtg., Atlantic City	June 26-30
International Trade Fair, Chicago	Aug. 7-19
SAE Nat'l West Coast Mtg., Los Angeles	Aug. 14-16
SAE Tractor Mtg., Milwaukee	Sept. 11
Nat'l Assoc. Motor Bus Operators Annual Mtg., Chicago	Sept. 13-15
Instrument Soc. of Amer. Conf. & Exhibit, Buffalo	Sept. 18-22
SAE Nat'l Transportation Mtg., New York City	Oct. 16-18
Nat'l Safety Congress, Chicago	Oct. 16-20
Society of the Plastics Industry Nat'l Conference, Swampscott, Mass.	Oct. 18-20
Amer. Society for Metals' Annual Nat'l Metal Congress & Exhibition, Chicago	Oct. 22-27
Amer. Welding Soc. Annual Mtg., Chicago	Oct. 22-27
Nat'l Lub. Grease Inst., Chicago	Oct. 30-Nov. 1



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SHAVING MACHINES  
THREAD GENERATORS  
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# 7-TYPE FELLOWS GEAR SHAPERS\*



\*7-Type 1½-in. maximum  
cutter stroke.

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and heavier duty.

Gears, of course... internal and external, spur or helical, shoulder gears, cluster gears, segment gears, variable radius gears, etc., in all sizes up to the 7-inch capacity of the machines. Cams, ratchets, sprocket teeth, splines, special shapes...for all such and more, these High-Speed Gear Shapers are a first choice wherever large numbers of parts are to be cut.

Illustrated here are two of many Attachments and Devices by which these machines can be most satisfactorily adapted to special work—at a saving in investment over a single-purpose machine. For data on the 7-series Gear Shapers, and an INFORMATIVE NEW BULLETIN on Special Attachments, write or phone the nearest Fellows Office.

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# more parts for less dollars with bunell

## SPECIAL MACHINES

**RIVETING MACHINE.** This Bunell Special Machine completes 300 automobile bumper face bars an hour, riveting the center face bar section to the two outer sections. The three sections are automatically positioned by the ram, which acts as a back-up for the rivets. Three hydraulic riveting hammers on each side cold squeeze the heads on six rivets simultaneously. Operation is completely automatic . . . or separate machine functions can be controlled individually.

● You can drop your unit costs to rock-bottom levels with Bunell Special Machines—ruggedly built for accurate, efficient operation. Our competent engineering staff, skilled personnel, and modern, complete plant are at your service. Let us help with your production problems. Write today!

**WELDING MACHINE.** One supporting clip is welded to each right and left hand automobile bumper face bar section by this Bunell Special Machine—which produces 300 pieces an hour. Automatic welding heads weld two sides of the clip to the face bar. While one section and clip are being welded, the opposite section and clip are loaded, so that operation can be continuous. Operation of each side of the machine is completely automatic. A flux recovery unit is included.



WRITE FOR CATALOG  
describing BUNELL facilities,  
methods and equipment.

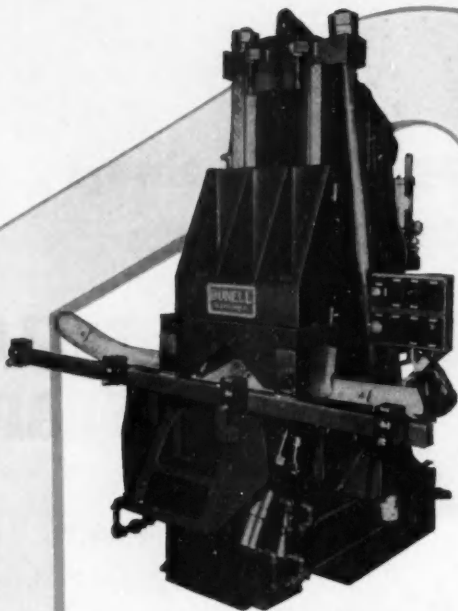


# BUNELL

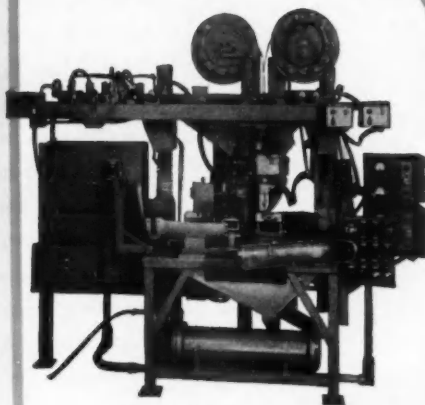
**MACHINE AND TOOL CO.**

1601 EAST 23rd STREET • CLEVELAND 14, OHIO

Since 1920, Designers and Builders of Special Tools, Dies, Jigs, Fixtures and Special Machines

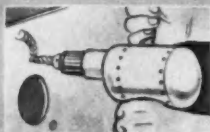


**RIVETING MACHINE**



**WELDING MACHINE**

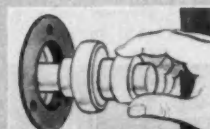
EASY TO INSTALL  
NO COSTLY MACHINING



1 Provide holes in machine frame to accommodate flange cap and flange mounting bolts.



2 Slip one half of flange, with cap side facing assembler, over shaft.



3 Slide bearing and collar on shaft.



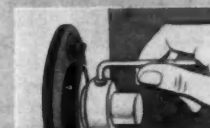
4 Slip other flange over shaft with cap side toward bearing.



5 Line up bolt holes of flanges with bolt holes on machine, slide bearing into proper position and bolt unit in place. DO NOT TIGHTEN BOLTS.



6 Repeat for other end of shaft and then tighten bolts on both ends.



7 Engage locking collar by turning in direction of shaft rotation until cam in collar drops over cam on inner ring. Continue turning until cam lock. Tighten set screw.

Now you can equip your machines with ball bearings at **NEW LOW COST**

... with  
**NEW EASE of  
INSTALLATION**



## The Fafnir Flangette

incorporating the famous Fafnir Wide Inner Ring Ball Bearing with Self-Locking Collar

Now you can add ball bearing performance, power economy and longer bearing life to your equipment within your cost limits. A brand new, simple, low cost housing idea eliminates costly machining, makes maintenance easier. A pair of pressed steel flanges which can be bolted anywhere on your machine, provides a lightweight, compact, sturdy housing for a standard Fafnir Wide Inner Ring Ball Bearing. Curved contour of inside surface of flanges matches curving contour of bearing outer ring to provide full self-alignment when installing the unit. A twist of the collar locks bearing to shaft. Sealed both sides with Fafnir Mechani-Seals . . . a labyrinth design of interlocking steel plates. Write today for illustrated folder. The Fafnir Bearing Company, New Britain, Conn.



# FAFNIR

## BALL BEARINGS

MOST COMPLETE  LINE IN AMERICA

# What's New at Indianapolis

By Edward J. Walsh

Executive Vice-President  
Kurtis-Kraft, Inc.

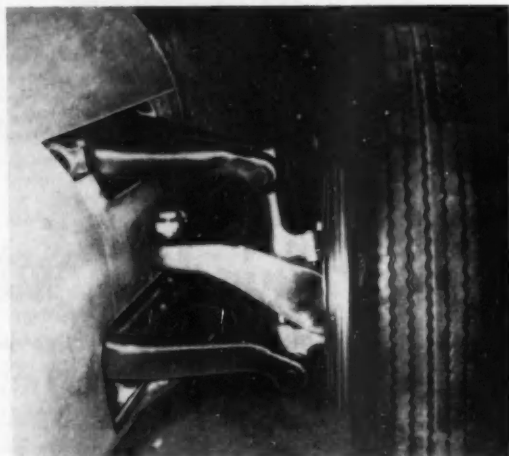


Fig. 1—Front suspension arms of the new Kurtis-Kraft cars consist of altered Ford lower support arms.

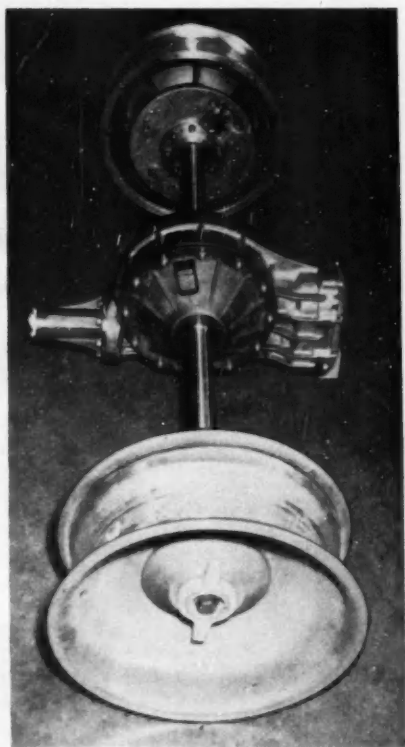
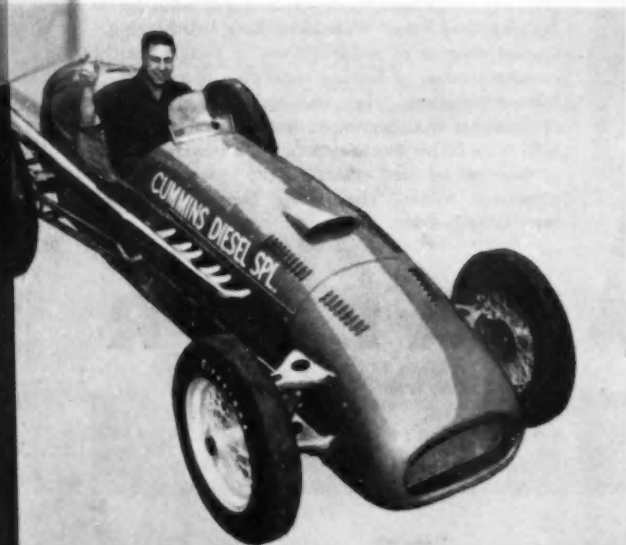


Fig. 2—Holibrand rear axle assembly which will be used in four of the Kurtis-Krafts and in Lou Moore's new car.



(Left) Here is the new Cummins Diesel Special with Jimmy Jackson, Desert Hot Spgs., Calif., at the wheel.

# This Year

**T**HE 1950 racing season is about to start with that famous annual event, the 500-mile race at Indianapolis. This year more entries than ever before are expected.

With 65 to 70 cars trying for 33 starting positions, competition during the qualification trials will be as keen as during the race. Since only about half of the entries may qualify for the race, it means that some very excellent cars must remain in the garages on Memorial Day.

Ten new cars at least have been built for this event. One is a Diesel, and two have the new Meyer & Drake supercharged engine.

The new Meyer & Drake engine has been developed from the 220 cu in. normally aspirated engine which Meyer & Drake and their predecessors have made for years. The bore of  $3\frac{3}{8}$  in. and the stroke of  $3\frac{3}{4}$  in. give it a displacement of 176 cu in. With an initial compression ratio of about 8:1, and the centrifugal blower delivering a pressure of 24 psig, 450 brake hp has been obtained at 6000 rpm. This is over  $2\frac{1}{2}$  hp per cu in. Since the old standby, the 270 cu in. Meyer & Drake, developed between 310 and 330 hp, the performance of the four cars equipped with this engine will be very interesting to watch. The new engine was described and illustrated in the April 1, 1950, issue of *AUTOMOTIVE INDUSTRIES*.

One of these engines is in one of the Maserati chassis owned by Indianapolis Racing, Inc. The gain in horsepower in this well-handling chassis should add greatly to its excellent past performance. Another of these engines is installed in Murrell Belanger's car that did so well in the early stages of last year's race. A third is in a new chassis built by Alden Sampson, whose name was last on the 16-cylinder supercharged Sampson Special. A new Kurtis-Kraft chassis has the fourth engine.

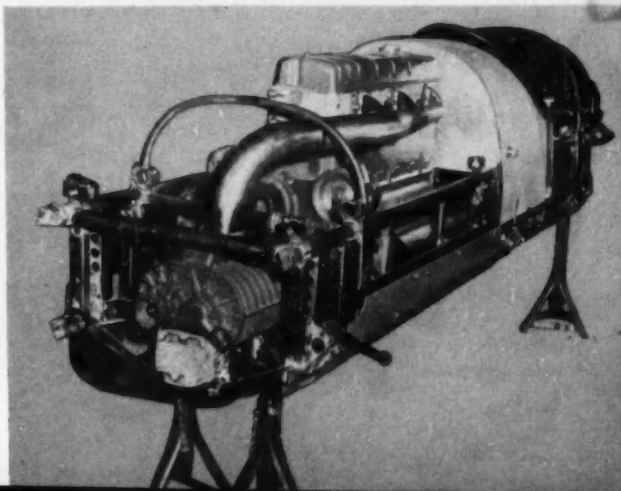
Probably the most interesting entry will be the Diesel engined race car of the Cummins Engine Co. The Indianapolis

rules were changed this year to allow for four stroke, supercharged Diesel engines of 402.68 cu in. maximum. Cummins Engine Co. worked for some months on the engine for its car, and dynamometer tests have shown very promising torque and horsepower characteristics. These are said to compare most favorably with the 270 cu in. Meyer & Drake engine which will furnish the bulk of the competition. The chassis was built by Kurtis-Kraft and is similar to their other new chassis described later.

A very unusual and promising chassis was built for Ray Brady by Dietl & Schroeder of Los Angeles. This chassis uses frame rails of duraluminum channel which have been boxed with the same material, the two sections being riveted together. The use of these metals makes the car extremely light as well as giving it adequate strength. This should make one of the lightest chassis ever built in this country. (See *AUTOMOTIVE INDUSTRIES*, April 15, 1950.)

Lou Moore, whose cars have won the 500-mile race so many times, has completed a fourth car for his team. This is a rear drive and shows the maker's thoroughness in construction and attention to detail. The front suspension is cleverly fabricated from tubing with the lower A arm carrying the forward end of the torsion bar which provides the springing. With four cars entered in the race, it would seem that Moore would have even better chance of repeating his past successes. (See *AUTOMOTIVE INDUSTRIES*, April 15, 1950.)

Kurtis-Kraft is building five new cars, one of which they will operate themselves. One of these is the Cummins Diesel mentioned previously in the article. Three will have the Meyer & Drake 270 cu in. engine and one the new 176 cu in. supercharged engine. The basic design of these cars is similar to the car which Johnny Parsons drove at the Speedway last year.



Cummins Diesel engine installed in Kurtis-Kraft chassis. Note the large Roots type supercharger.

The body design has been altered and the front suspension, while the same geometrically, has been redesigned. Fig. 1 shows the upper and lower A arms which are altered Ford lower support arms and attached to a Ford spindle carrier. Dual steering shafts are used so that no tie rod is required. The upper A arm carries the torsion bar for springing.

While the Cummins Diesel will use a Conze rear axle, the other four Kurtis-Krafts and Lou Moore's

new car are using the new Halibrand rear end shown in Fig. 2. This rear end uses a solid piece of steel tubing straight through from hub to hub. The drive passes underneath the center section shaft, and the power is then carried upward through spur gears to the pinion which goes in from the rear. This entire center section casting with side covers is magnesium. The spur gears may be quickly changed to give any

*(Turn to page 64, please)*

## Rounds Rear Engined Racer Rebuilt

by R. Raymond Kay

**T**HE only rear engine car expected to compete at Indianapolis this year is the N. J. Rounds "REC Special," which Sam Hanks will drive. For the 1950 classic, it has been rebuilt under the supervision of veteran Clyde Jones, chief mechanic, Rounds Engineering Co. Walt Heinbuch, Jr., superintendent, Tool

Design Engineering Co., Culver City, Calif., worked closely with Jones.

Independent torsion bar suspension is used both front and rear. The rear suspension is of the DeDion type, similar to that used in the Auto-Union cars of Germany in 1938. The chassis frame is constructed of 3.5 in. 4130 steel tubing.

The body of the "REC Special" is streamlined and well proportioned and the car is extremely low for Indianapolis racers—with full load and driver it is 4.5 in. from the ground. The driver is seated at the halfway point.

Weight of the racer, which is powered by a 270 cu in. Meyer & Drake Offenhauser engine, is 2267 lb. Wheelbase is 100.25 in. with 57 in. tread.

Transmission, clutch, and final drive are assembled in one unit, and power is delivered to the rear wheels through Rzeppa type universal joints.

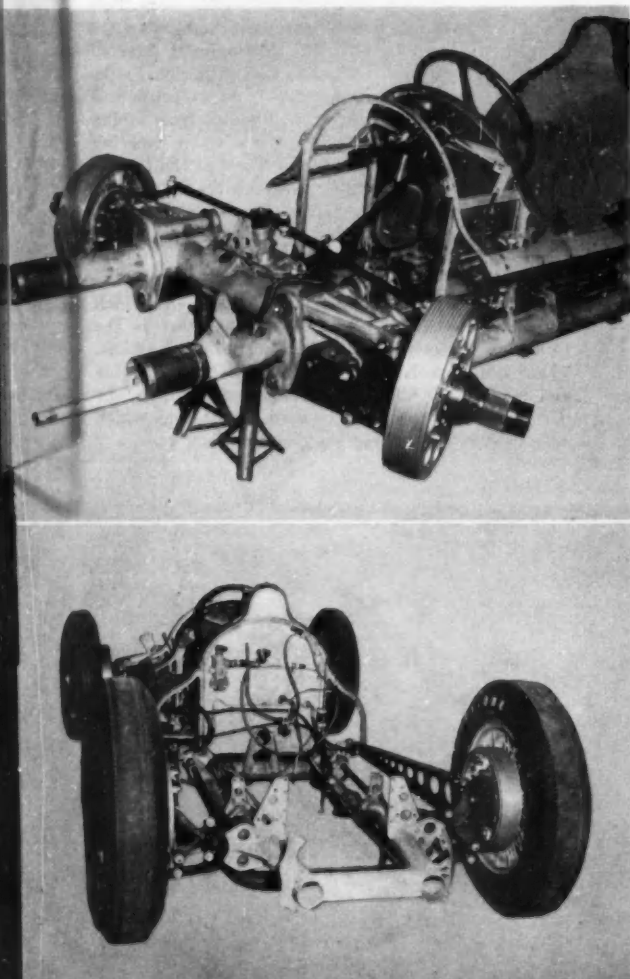
Fuel supply tanks, along with the water radiator, are arranged under the dash cowl and across the front members of the spring suspension. Additional fuel tanks are placed along the frame, beside the driver's seat, one on each side. Fuel capacity is 54 gal, oil 10 gal, and water 9.5 gal. The fuel tanks are mounted in a central position, where they afford a constant weight distribution, varying less than 1.7 per cent between full and empty tanks.

Two shock absorbers are used on each wheel of the car. This arrangement is expected to compensate for the physical

*(Turn to page 84, please)*

*Left—This rear end view shows the independent rear suspension with crossunder axles and torsion bar springing.*

*Top—Fuel tanks as well as the water cooling radiator will be arranged under the dash cowl and across the front members of the chassis frame. Additional fuel tanks will be placed along each side of the frame beside the driver's seat.*





# Faster Inspection of Connecting Rods

By C. J. Moody

Supervisor, Quality Control Laboratory,  
Ford Motor Co.

By the application of advanced methods, the inspection of Ford connecting rod forgings has been developed into a fast, positive and economical procedure which combines other interesting features as well. For example, former practice involved the pickling of forgings to remove scale and rust prior to individual piece inspection for defects such as forging laps, heat treat cracks, etc. The procedure now in effect is to shot blast the forg-

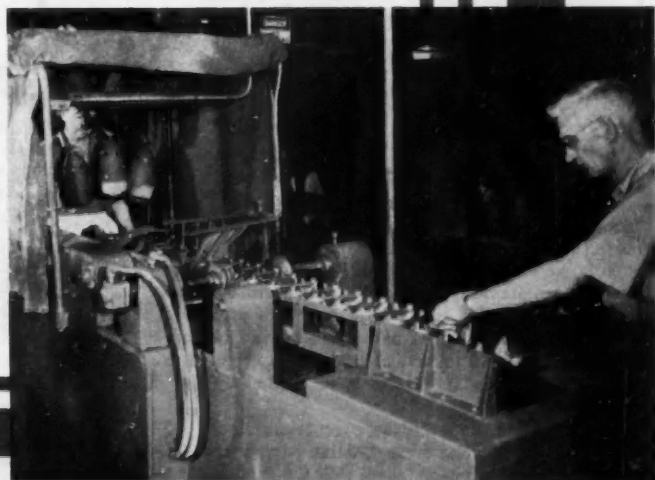
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please)



Fig. 1 (Left)—This is an example of a permissible Magnaglo indication as identified in the inspection manual.

Fig. 2 (Right)—Here is an example of the type of Magnaglo indication which is a basis for rejection and scrap.

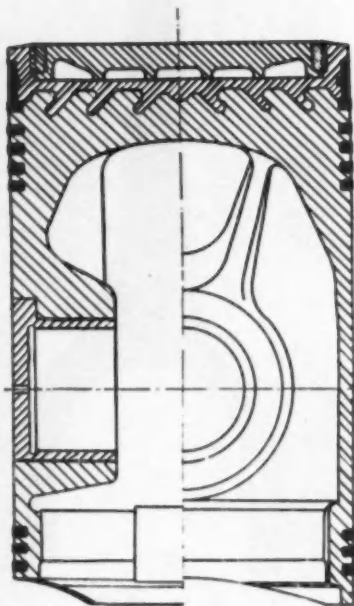
(Below)—View of Magnaflex inspection machine used at Ford for Magnaglo particle inspection of connecting rods. Rods are loaded on the power driven conveyor by the operator on the right. The operator in the booth at the left observes surface indications while the rod is being revolved by the rotating fixture.



# Aircooled Two-Stroke Diesel

By Wolfgang E. Meyer

Associate Professor  
The Pennsylvania State College



The piston has a cast-in steel plate into which a heat-resistant plate is screwed. A slotted, nitrided steel fire ring provides additional protection against heat at the upper piston ring.

**A**n interesting design for an aircooled high-speed two-stroke cycle Diesel engine, developed during the war for use in tanks and armored vehicles, has only recently been described for the first time in the foreign technical press. This engine, rated at 700 hp at 3000 rpm, was developed by the Austrian Saurer Corp. Its designer, Dr.-Ing. Klaus Karde, has supplied the data for this article from his personal notes. All existing engines and practically all of the drawings are thought to have been lost due to the combat activities during the conquest of Vienna by the Russians.

This engine was intended as a replacement for a water-cooled four-stroke cycle gasoline engine at 600 hp. The chief requirements were that the same space

was to suffice, that all parts requiring frequent service be easily accessible, and that the new engine be capable of maximum output of 700 hp.

No complete engine was built because of the obstacles produced by the progress of the war. But all necessary one-cylinder tests had been concluded and the design for the full-scale engine was completed. Its principle specifications were to be:

12 cylinders in a 90 deg V-arrangement.

Bore: 4.34 in.; stroke, 6.30 in.

Displacement: 92.7 cu in./cyl, 1107 cu in. total.

Distance between cylinders in the same row, 6.61 in.

Compression ratio: 13.5:1.

Approximate dimensions: length 52.8 in., width 38.2 in., height 36.2 in.

Total weight: 3500 lb with cast-iron crankcase.

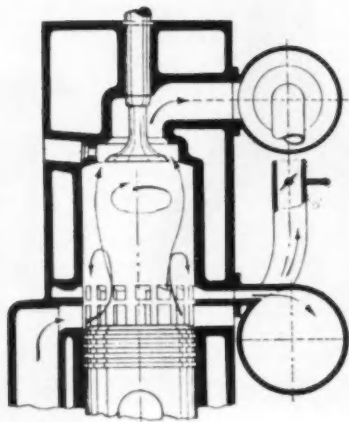


Fig. 1—The scavenging system is illustrated in this sectional view of an experimental water cooled cylinder.

# Engine of Unique Design

Output: maximum 700 hp at 3000 rpm, continuous 600 hp at 2600 rpm.

The most noteworthy feature of this engine is its scavenging system, which is a combination of uniflow and mushroom scavenging, as will be seen from Fig. 1 which shows a cross section through a water-cooled experimental cylinder. There is a single exhaust valve in the cylinder head and there are intake ports at the bottom of the cylinder as in a conventional uniflow engine. In addition, exhaust ports are provided immediately above the intake ports. These exhaust ports open a few degrees after the exhaust valve lifts off its seat and permit rapid blowdown. However, the ports do not discharge directly into the main exhaust manifold but into a chamber which is connected over a throttling valve to the main manifold. This valve is so adjusted that a pressure approximately equal to the mean pressure in the cylinder during the scavenging period is maintained in the auxiliary exhaust chamber. It can be left in a fixed position for all speeds down to 600 rpm and for all loads up to about 85 lb/sq. in. bmep. Only beyond these points an adjustment of the valve was found to improve the performance of the engine.

This scavenging system was chosen because it tends to equalize the thermal load between the cylinder head and the port section of the cylinder, a consideration which is of particular importance for an aircooled engine. Another advantage is the reduction of the exhaust resistance which has an important bearing on the power requirements of the scavenging blower.

The inlet ports are shaped so that the air will flow over the entire piston crown; there the individual streams will meet and deflect each other in an upward direction. Some of the scavenging air will flow out through the exhaust ports; but since the throttle valve maintains a pressure in the auxiliary chamber which is above that in the exhaust manifold, the volume of air taking this path is very small. However, the exhaust ports will tend to pull the main scavenging air stream toward the cylinder walls, and thus spread it out over the entire cylinder cross section. Therefore this engine requires no tangential orientation of the inlet ports in order to obtain optimum scavenging of the entire cylinder volume. This reduces the scavenging work still further.

Actually the incoming air is given a slight tangential component (less than in conventional uniflow-scavenged engines) but only in order to assist the distribution of the fuel in the combustion chamber which has the shape of a cylindrical disk of a diameter smaller than the bore. Superimposed is a secondary motion of the air produced by the close approach of the outer rim of

the piston to the roof of the cylinder, thereby producing a rapid inward radial motion of the air. Smoke-free combustion was obtained with this combustion chamber up to 110 lb/sq. in. bmep. The nozzle enters the combustion chamber from the side at an angle of five deg against the horizontal. The nozzle has three

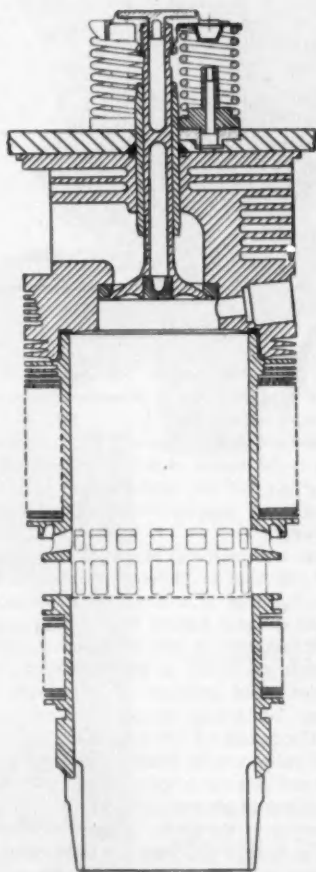


Fig. 2—Longitudinal section of the aircooled cylinder and head assembly. This is the design as it was to be used in the full-scale engine.

## Diesel Engine of Unique Design

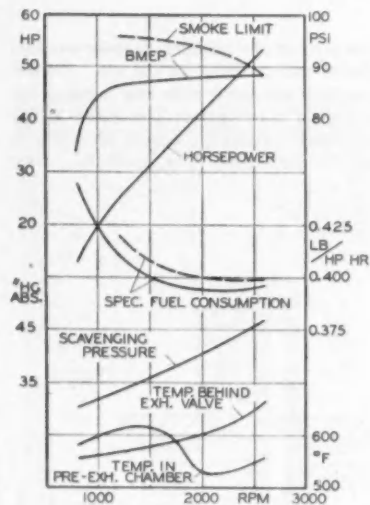


Fig. 3—Single cyl. engine performance.

holes in one plane, the central hole being 0.35 mm, the two outer ones 0.25 mm in diameter. The nozzle opening pressure is 2300 psi.

The aircooled cylinder is shown in a cross section in Fig. 2. This is the design as it was to be used in the full-scale engine, and the performance data shown were obtained on a single-cylinder engine equipped with this cylinder.

This cylinder is mounted by means of a flange at the upper end of the head to the engine case which also performs the function of a cooling air ducting system. Thus the cylinder liner is free to expand downward without restraint of any kind and it does not have to transmit gas forces in the axial direction.

The cylinder head consists of aluminum alloy (Hydronalium) containing 10 per cent magnesium, 0.5 per cent silicon and 0.5 per cent manganese. The inserted steel valve seat is Stellite faced. Connection between head and liner is made by means of a special thread with 30 deg angle and radii at tip and root of nearly one-quarter of the pitch. There is about 0.008 in. interference so that the head has to be shrunk on the liner, giving in conjunction with a copper gasket a perfectly reliable connection although the thread engagement is only 5/16 in. The liner is made from a centrifugal casting with machined cooling fins which extend well below the ports and below the lowest posi-

tion of the lowest compression ring in order to assure minimum piston ring temperatures. The bore is lightly tapered, being about 0.003 in. larger in diameter at the bottom than at the top. In addition, at the ported zone of the bore 0.001 in. is lapped out in order to prevent piston seizures.

The piston is a permanent-mold casting with a cast-in steel plate into which a heat-resistant plate is screwed. This design endeavors to block the flow of heat to the ring zone as much as possible. The top ring is further protected by a slotted fire ring of T-section and made of nitrided steel. The connecting rod is of H-cross section, but the H is positioned at right angles to the conventional arrangement. This permits the use of large diameter milling cutters for this overall-machined design, resulting in a considerable saving in machining time. The forked rod of the full-scale engine is designed according to the same principle. The lower half is centered by horizontally-split bearing shells and is held by two bolts which engage threads in the rod end.

The exhaust valve is actuated directly by an overhead cam shaft. The upper spring seat is fastened by means of a threaded connection and carries a chilled cast iron plate against which the cam operates. Shims can be placed under this plate for adjusting the valve clearance. There are four springs for each valve. Their installation can be seen from Fig. 2. The springs can be exchanged individually without disturbing any other parts. Breakage of one spring would still permit operation of the engine to nearly its maximum speed, although spring failure is much less likely with this design than with a single spring because of the better fatigue strength of thin wire.

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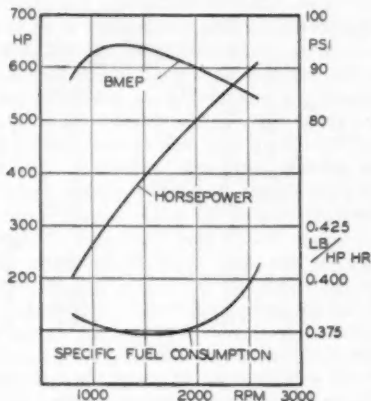


Fig. 4—Calculated performance of 12 cyl. engine.

# The Increasing Use of Pneumatic Tools in Automobile Production

By Clair H. Culbertson

Plant Engineer  
Ford Motor Co., Long Beach, Calif.

**T**HE aircraft industry borrowed production ideas from the automobile industry before the war and then went on to develop new production methods. These methods, in turn, are now being borrowed by the automobile industry. One of the results is an increasing use of compressed air in the manufacture of postwar automobiles.

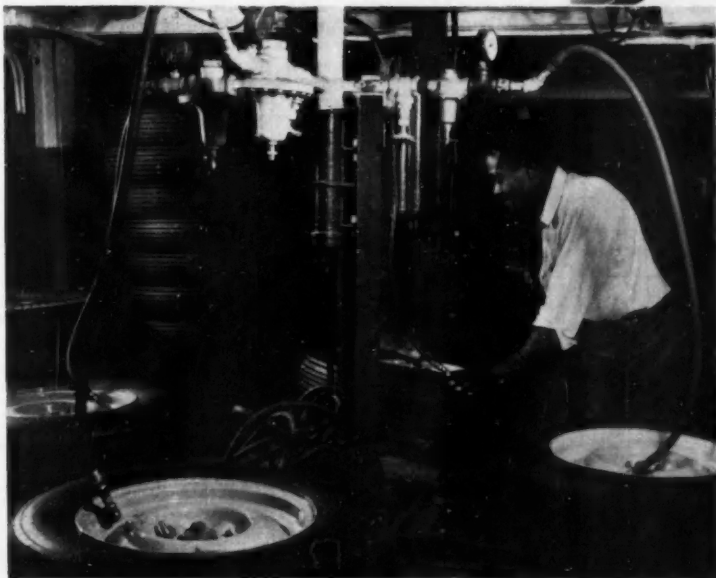
Examples of this trend may be found in the Ford branch assembly plants throughout the country. Ford's Long Beach, Calif., plant is typical of the others and was the one visited to obtain the compressed air application data which is presented here.

One of the most notable changes along the production lines is the large number of pneumatic tools in use. Before the war, less than one per cent of the portable tools were air-operated and now over 35 per cent are air-operated with the percentage growing.

Air-operated impact wrenches are among the most  
(Turn to page 72, please)



Bolting a brake backing plate in place with an air-operated wrench is a typical application for this type of tool.



This tire mounting machine is said to be the first used in the industry. An air cylinder pushes the tire while the wheel turns. The machine is still in use.



# Automotive Production

## Featured at

WITH a high attendance which included a greater number of top executives than any previous exposition held by the Society, the Eighteenth Annual Meeting and Exposition in Philadelphia last month ranked among the most successful ever held by the American Society of Tool Engineers. Great interest was shown in the exhibits as well as in the technical sessions which featured the presentation of 20 papers. Many of the new products displayed were described in *AUTOMOTIVE INDUSTRIES*, April 1.

Herbert L. Tigges, Vice-President, Baker Brothers, Toledo, Ohio, was elected to the presidency of the Society for 1950-51. Succeeding Mr. Tigges as First Vice-President of the ASTE is J. J. Demuth, Methods Engineer and General Superintendent, Sligo, Inc., St. Louis. H. E. Collins, engineer with Hughes Tool Co., Houston, Tex., was elected Second Vice-President, and Roger F. Waindle of Elgin National Watch Co., Aurora, Ill., was named Third Vice-President.

W. B. McClellan, Gairing Tool Co., Detroit, and George A. Goodwin, Chief Tool Engineer, Standard

Electric Co., Dayton, Ohio, were reelected National Secretary and Treasurer, respectively, and W. A. Thomas, Ford Motor Co. of Canada, Assistant Secretary and Treasurer.

Elected to the Board of Directors were the following: H. L. Tigges, Executive Vice-President, Baker Bros., Toledo; L. B. Bellamy, Sterling Grinding Wheel Co., Detroit; Jos. T. Crosby, Vice-President, Lapointe Machine Tool Co., Hudson, Mass.; J. J. Demuth, Methods Engineer & General Superintendent, Sligo, Inc., St. Louis, Mo.; T. J. Donovan, Jr., President, T. J. Donovan Co., Philadelphia; R. B. Douglas, President, Godscroft Industries, Montreal; V. H. Ericson, President, Johnson DeVou, Inc., Worcester, Mass.; E. W. Ernst, Superintendent of Punching Tool & Die

## Nitriding Of High Speed Steel

By J. G. Morrison  
Chief Metallurgist  
Landis Machine Co.

IN general, nitriding has been applied to those tools which take rela-

tively light cuts. The present study is directed toward relatively "deep" cases, depths of the order of about 0.0017 to 0.0025 in., as a result of nitriding for one to two hr at a temperature of about 1025 F. There is some indication that a stress-relieving treatment fol-

lowing nitriding may enable extended usage of the process.

Several experiments carried out in the gas nitriding of AISI 4140 steel heat treated to approximately 300 Brinell, and in hardened and hardened and drawn 18-4-1 high speed steel may

TABLE I

Several specimens of A. I. S. I. 4140 steel and 18-4-1 high speed steel gas nitrided for various times. Effect on the case hardness of nitrided and nitrided and drawn at 1075 F. or 1100 F. specimens.

Specimen No.	Material	Treatment	Gas Nitrided	Case Depth	Subsequent Treatment	Rockwell		
						Core Rc	Case	
							Ra	Rc
17-1	4140	1825 F.-Oil 1125 F.-2 hr	48 hr 1010 F.	.030"	none	30.6	78.5	47.0
17-1a	4140	1125 F.-2 hr	48 hr 1010 F.	.030"	1100-1 hr	29.8	75.5	47.0
17-3	4140	1125 F.-2 hr	30 hr 975 F.	.018"	none	31.0	74.5	45.5
P-1	18-4-1	2325-Oil	48 hr 1010 F.	.012"	none	63.0	88.6	70.3
P-1a	18-4-1	2325-Oil	48 hr 1010 F.	.012"	1075-1 hr	63.0	88.3	70.5
P-2	18-4-1	2325-Oil 1050-1½ hr	48 hr 1010 F.	.012"	none	62.5	88.7	70.3
P-2a	18-4-1	1050-1½ hr	48 hr 1010 F.	.012"	1075-1 hr	62.5	88.3	70.4

# Methods

## the ASTE Annual Meeting

By H. H. Roberts

Div., General Electric Co., Schenectady, N. Y.; B. J. Hazewinkel of the L. S. Starrett Co., Denver; A. D. Lewis, Manager, Art Lewis Production Equipment Co., Glendale, Calif.; and Fred J. Schmitt, Director, D. A. Stuart Oil Co., Ltd., Chicago.

Setting up of a research foundation to carry on basic production research was authorized at the Board of Directors' meeting. Frank W. Wilson will head the foundation for which an initial fund of \$25,000 was appropriated. Present plans call for the use of existing production research facilities at universities and colleges. In addition, the foundation will act as an intermediary to assist small industries or companies interested in basic research but not in a position to finance such projects.

be of academic interest. Specimens, approximately  $\frac{1}{2}$  by  $\frac{1}{2}$  by 1 in., were ground on a broad surface after heat treatment and then polished as for microscopic examination. They were then gas nitrided for various times and temperatures. The specimens were then nicked in two and one portion drawn in a neutral salt bath for one hr at 1075 to 1100 F.

Examination of the Rockwell A and C impressions (at 100X) on the polished cased surface of the specimens listed in Table 1 shows the following: The 4140 sample, No. 17-1, nitrided at 1010 F for 48 hr shows cracks radiating from the peripheries of the impressions. Specimen 17-1a was given the same nitriding cycle but reheated to 1100 F for one hr in a neutral bath; the Rockwell A and C numbers of the case were unchanged but the impressions were free from radiating cracks. Specimen 17-3 nitrided at 975 F for 30 hr showed both the A and C impressions to be free of radiating cracks in the as-nitrided condition.

Inspection of the Rockwell A and C impressions of 18-4-1 specimens P-1, P-1a, and P-2 and P-2a showed only slight differences as regards shatter of the C impressions and the radiating cracks about the A impressions. In clamping the specimens together for the polish preparation spalling of the edges was considerable on the portions

nitrided only and much less so on the portions drawn at 1075 F.

The hardness numbers on the specimens of 18-4-1 steel given in Table I are to be taken with some reservation because of the cracking and shatter of the impressions; also the Brinell mortality is quite high in taking Rockwell C impressions on deeply cased high speed steel.

### The Technique Of Micro Drilling

B. J. A. Cupler  
General Manager  
National Jet Co.

**M**ICRO-DRILLING begins when the factors governing an operator's treatment of a drill and technique in using it are no longer apparent to him without the aid of sensitive drilling equipment and optical aids. Reference here is to cuttings and the story they have to tell to the operator concerning the quality of the cutting edges of the drill itself and the peculiar nature of the material which is being drilled—in short, its machinability or drillability.

In micro-drilling the specific factors affecting drill-life according to our observations are as follows:

1. Material or alloy from which the drill is made.
2. Physical structure of the drill, that

A resolution to work with the Army Ordnance Association on national preparedness plans was adopted by the Board of Directors, and a \$25,000 fund offered by an anonymous Chicago concern to permit increased Tool Engineering scholarships in the state of Illinois was accepted. U. S. Senator Ralph E. Flanders and E. W. Ernst, Chairman of the Handbook Committee of ASTE, were presented honorary membership.

The next annual ASTE convention is scheduled for March, 1951, in New York City, and the next industrial exposition and annual meeting will be held in Chicago during the week of March 17, 1952.

Following are abstracts of some of the papers which were presented at the technical sessions held each day during the meeting.

is, if a twist drill, web thickness, point angle, rake angle, and cutting clearance on the side of the drill. If a pivot or spade type drill, web thickness, point and rake angle and back taper or clearance on the drill blade itself. The points and rake angles of drills must be made to conform to the requirements of the particular material which is being drilled. The point angles will vary normally from 118 deg for soft materials to approximately 135 deg for harder materials and the rake angles from 8 deg to approximately 15 deg over the range of conventionally drillable materials.

3. Rpm of the drills, since this rpm necessarily varies in the drilling of different materials, is one of the major factors affecting drill life or the lack of it.

4. With specific reference to micro-drilling, the most vital factor affecting drill life is the trueness or concentricity with which the drill turns.

It is very difficult, if not impossible, to develop an adequate chart pertaining to speeds and feeds in the drilling of various types of materials when using small and microscopic drills, since there are so many variables and influencing factors. With respect to speeds and feeds, there is no such thing as a straight-line curve relationship between the two. Although in some cases speeds of 7000 rpm have been

used successfully, it can generally be depended upon that speeds in excess of 4000 rpm for drills as small as 0.020 in. diam are impracticable. Speeds not in excess of 2800 rpm generally will give the most satisfactory results as to hole quality and drill life regardless of the material to be drilled. These rules on rpm are based on maximum drill life, maximum hole quality coupled with duplication of hole size over many hundreds of holes. Deviation from these basic rules will not result in inability to drill, but a penalty will be paid. It will result in shorter drill life, more burring, tapered or funnel-shaped holes or increasing inability to duplicate hole size to close tolerances. If any rules should be kept in mind regarding speeds and feeds in the use of small and microscopic drills, it should be this: As the drill decreases in diameter below 0.020 in. the rpm should be decreased rather than increased and the feed per revolution of the drill should be compatible with the ability of the drill to withstand the torque. The operator should bear in mind that as the diameter of the drill is decreased one half, the area is four times less and consequently, the torque resistance is considerably less.

## Design Factors In Investment Casting

By T. F. Frangos  
Haynes-Stellite Div.  
Union Carbide and Carbon Corp.

A BRIEF study has been made on the variations in dimensions of investment castings made from plastic patterns. A representative number of castings were checked and the results were plotted around the nominal cast-

ing size to show the distribution of the cost sizes.

Results obtained on a small, thin, flat casting about 9/10 in. long are shown in Fig. 1.

One hundred castings were checked and 97 per cent of the castings fell in a plus or minus 0.004 in. range, while 100 per cent fell in a plus 0.006 in., minus 0.004 in. range.

A casting of compact shape will have less dimensional variation, largely due to the simplicity of its general shape, and relatively small length to thickness and length to width ratios. As an example, a small casting 3/4 in. long by 3/4 in. wide by 3/4 in. thick, has the dimensional variations shown in Figs. 2 and 3.

Ninety-five per cent of the castings fall within 0.007 in. range. The uniformity contributes toward minimizing finishing costs on this particular casting.

The high side of the graph is somewhat spread out. This is due to the occurrence of small positive defects of one or two thousandths in. height.

A check was made on the 3/4 in. dimension (width) after 100 castings had been touched on a sand belt, to remove the small positive defects. No appreciable stock was removed from the castings. The distribution is more symmetrical, having less distortion on the high side. All castings fall within a 0.006 in. range.

These examples of typical invest-

ment castings illustrate some of the capabilities of the investment casting process, and show how it is gaining greater effectiveness as a tool. There are designs that cannot be made at a practical cost except as investment castings.

Familiarization of designers with investment castings will automatically bring more applications to the industry and result in greater flexibility and versatility to their products.

During its development stages the cost of investment castings was relatively high, but as refinements are introduced in the process the costs become lower and lower and now attractive prices are being offered on more and more applications.

## Broaching Applications For Cost Reduction

By O. W. Bonnate  
Chief Research Engineer  
The Lapointe Machine Tool Co.

PERHAPS the greatest factor in reducing broaching costs has been the development of better fixtures by the tool engineer. Better methods, automatic clamping and automatic ejection has resulted in the operator's merely placing the part into the proper nest and pushing the proper button. This has two important results. First, the operator can produce far more parts during any given period of the day, and with

(Left)

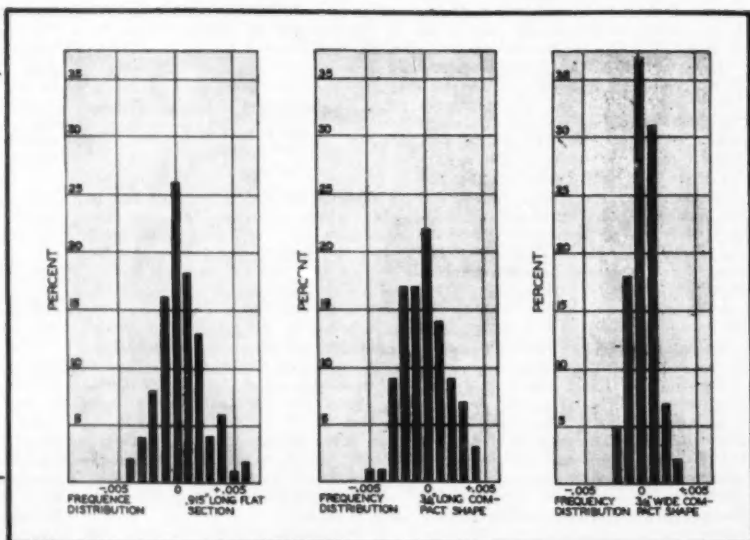
Fig. 1 — Frequency distribution of dimensional variations in casting a small, thin, flat part.

(Center)

Fig. 2 — Distribution of dimensional variations of a more compact part than that shown in Fig. 1.

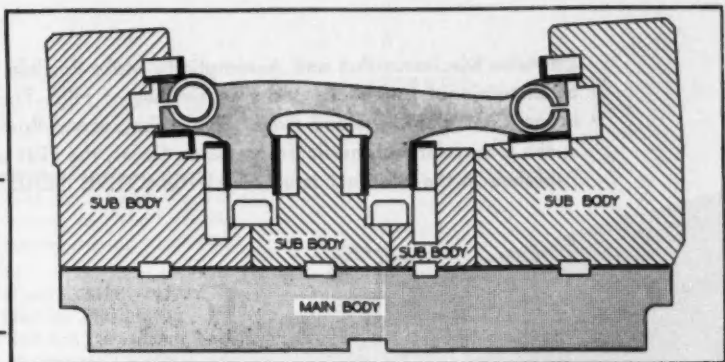
(Right)

Fig. 3 — Distribution of dimensional variations of a small, compact part. Variation is reduced because of the simplicity of the part.



## Methods Featured at ASTE Meeting

Fig. 4—Redesigned machine setup for broaching the front spindle. Eight surfaces are broached, and the new method enabled the part to be completed in one pass.



the reduced work load can maintain a higher average daily production. Second, better machine designs have aided higher overall production by increasing the production rate and decreasing the amount of down-time per machine.

Fig. 4 illustrates an efficient setup for broaching the front spindle used by a large automobile plant. As there are eight surfaces on this that are machined, the previous method involved broaching in three separate operations, thereby using three separate machines with their fixtures and tools. The production on these three machines was in the vicinity of 240 parts per hour and naturally required three operators to do this. By redesigning the complete setup using a heavier machine than formerly, the eight surfaces were completed in one pass. The parts are now produced on one machine with one operator at a rate of 360 parts per hour as against 240 previously.

### Hard Chrome Plating

By Brayton A. Taylor

Vice-President

Chrome Electro-Forming Co.

**H**ARD chrome plate is applied to new tools and gages for securing increased production life; to bring undersized used tools back to original specified dimensions or to new requirements, and to provide abrasion-resistant wear surfaces on many types of machined or formed parts and products.

The typical hard chrome plating process deposits relatively thick coatings of from 0.0005 to 0.01 in. It is applied directly to the steel or other base metal, as contrasted to decorative coatings, usually not more than 0.00005 in. thick and applied over some preparatory coating. The final coating, in

either case, has a hardness from 850 to 950 Brinell.

Resultant surface may be described as soapy or slippery, with a low coefficient of friction and hence a great reduction in the tendency to galling in close-fitting elements moving in relation to each other.

Preparation of the base metal is a most important prerequisite to successful hard chrome plating. The metal must be free from all scale, burrs, burns, and from metal turned over during grinding. It must also be free from deposits left as a result of secondary heat treatments such as cyanide baths.

The smoother the finish before plating, the better will be the results after plating. Even when applied in the thickness common to this process, hard chrome plating will, when viewed under suitable magnification, show the same surface characteristics as were left on the unplated base metal.

High spots or areas on the base metal before plating invite early peeling, chipping and flaking of the plate under pressures encountered in service. As an analogy, place a piece of plate glass on a somewhat distorted or uneven surface. Apply relatively slight pressure and the glass will break. Place the same type and thickness of glass plate on a truly flat surface and it will not break under several tons pressure.

Another important requirement for good hard chrome plating is that the base metal be hard enough to support the plate. Providing the surface has been properly prepared; the plate will adhere as well to a base metal of Rockwell 40C or lower as to metal of Rockwell 64C or higher. However, the compressive action of forces locally applied in a plated surface tends to drive the plate into the base metal. If the base metal yields under the pressure, the

plate will itself bend or deform, with every probable early failure.

In a nutshell, hard chrome plate can only be as good as the surface to which it is applied.

### Carbide Die Developments

By George Eglington

Vice-President

Lincoln Park Industries Inc.

**P**ROBABLY the most important consideration in the mind of the prospective user of a carbide die is whether the stamping job under consideration justifies the use of carbide. It is obvious that if one or more presses are engaged full time in the production of one stamping then consideration should be given to the use of carbide. Most of the dies built so far have been used under these conditions.

The borderline between when to use a carbide die and when not to is hard to establish, especially when only one steel die is required to maintain production. It might seem in this case that carbide would not justify consideration at all, since it is sure to require a heavier initial outlay. However, it might be that press time could be shortened to the point where the press could take on other work; the maintenance time involved in servicing the steel die might be considerable; and the quality of the stamping be so improved by making it in a carbide die that subsequent inspection or assembly problems are reduced or eliminated. Any one, or a combination of these conditions could justify a carbide die.

Probably the earliest approach to operating carbide in a cutting application in a punch press was the substitution of cutting elements of carbide to replace steel elements formerly used.


(Turn to page 67, please)

# Exacting Machining Standards

Extensive Mechanization and Automaticity Make Possible Close Control of Dimensional Tolerances and Fine Finishes at High Production Rates in the Chevrolet-Cleveland Plant. This Is the Second Production Article in the Chevrolet Automatic Transmission Series, the First of Which Was Published in the March 1 Issue of AUTOMOTIVE INDUSTRIES.

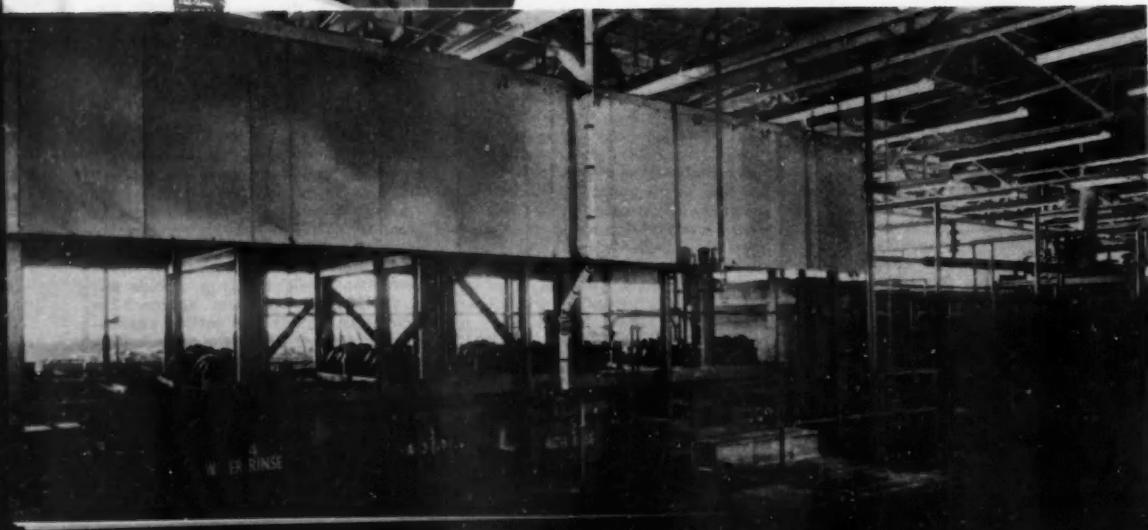
**E**XCEPTIONALLY close control of dimensional tolerances, fine finishes, oil-tight gasket joints requiring lapping operations, and fine fits combine to make the manufacture of the Chevrolet Powerglide transmission quite comparable to the building of military aircraft engines during the war, in the opinion of the Chevrolet management.

Powerglide production is cloaked with particular significance when it is considered that this is the first drive of its kind designed for installation in cars in the lowest price



One of seven final test machines used for testing Powerglide transmissions in the assembly department. As shown, the operator uses the push button panel for speed control under various maneuvers. The circular dials on the panel board give readings of oil pressure while rectangular instruments show readings of torque and rpm. The lower circular dial shows vacuum readings.

This is a perspective of the enormous piece of equipment for stress relief and "de-siliconizing" of all castings. At the right is the Halcroft furnace; in the foreground—the liquid salt bath followed by hot water rinse, acid dip, rinse, and oil dip.





# for Powerglide Transmission

By  
**Joseph  
Geschelin**

bracket. From the standpoint of management, the secret of their ability to produce Powerglide to such exacting standards is found in the degree of mechanization and automaticity of precision operations developed here.

At the present writing responsibility for its manufacture is divided between the Chevrolet-Flint plant, where the fabricated converter elements are produced, and the Chevrolet-Cleveland plant where all machining and assembly operations have been concentrated. Because of the extent of this activity, the present study has been confined arbitrarily to a sampling of unusual operations and techniques at the new Chevrolet-Cleveland plant. An overall sampling of the manufacturing process is being presented in three installments, the first one covering torque converter fabrication having appeared in *AUTOMOTIVE INDUSTRIES* March 1, 1950, page 38.

Occupying over 150,000 sq ft of floor space are more than 350 major

*Typical of Sheffield Precisionaire inspection equipment used widely in the Chevrolet-Cleveland plant is this group for gaging three holes in the valve body. The gage on the left—for the accumulator bore—is calibrated to 0.0001 in. while the instrument on the right—for checking two valve holes—is calibrated to 0.00005 in.*

*Static balance of the sub-assembly consisting of the primary pump and housing assembly together with cover and oil is done in the GMR balancer at the right as shown. Balance weights are welded on at the center line of the housing by means of special welder seen at the left.*



items of machine tools, almost one-third of these being of special precision type. They include a large aggregation of Ex-Cell-O precision-boring and drilling machines of various kinds; New Britain precision boring machines; Crane lapping machines, various makes of grinders, etc. Supplementing the machine tools are eight washing machines through which the work is progressed to assure cleanness.

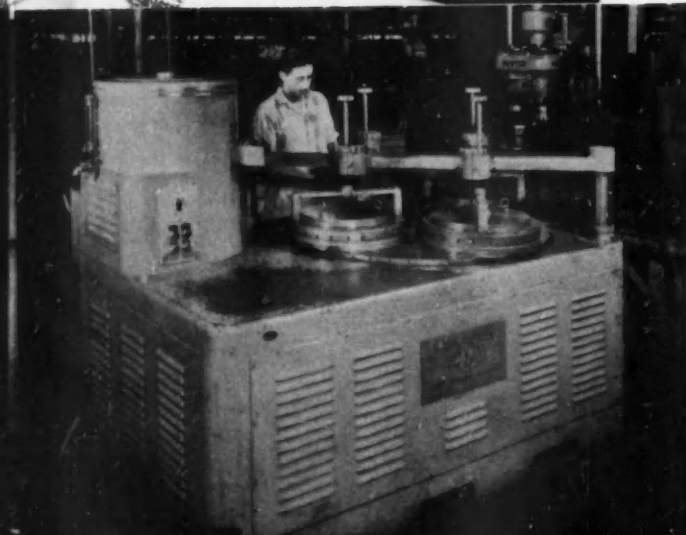
The final assembly department is housed in a large enclosed area and supplied with filtered air under pressure to prevent entry of dust or dirt. At the present time this department has nine final assembly testing machines.

In a general way, the various production lines, extending from east to west, are arranged so that the heavier castings—the bell housing and the transmission case—occupy the south side of the area, nearest the receiving dock. Next are some of the smaller castings, while the westerly portion is occupied by lines that produce the valve body, the side covers, the modulator housing and similar parts. The area to the north of the casting lines is given over to the machining of torque converter parts and the production of steel parts such as gears, shafts and the planet carrier. The heat treat section is at the west end of these lines, with the assembly room extending across the westward corner.

As will be described later, the general procedure is to handle the roughing operations in Bullards, or automatics, and finishing operations on other equipment. Some of the finishing operations, on specific parts to be noted later, are handled in Ex-Cell-O machines, New Britain precision boring machines, Heald-Bore-Matics, Micromatic Hydrohoners, and Crane and Norton lapping machines. Too, the plant boasts a considerable installation of cylindrical and surface grinders.

Since precision is emphasized at every stage, a basic principle established here is that all castings must be stabilized by stress-relief to pre-

*An example of Lo-Swing setups for sheet steel machining is this one on the brazed turbine assembly. Tooling is arranged for facing excess stock from the rear face of the flange, and from inner and outer shells. The left hand tool block has six tools, the right hand two tools, all tools being tipped with cemented-carbide.*



*Here is a view of the Crane Packing Co., 48-in. Lap-master for lapping valve bodies. Each of the four fixtures contains three pieces, finishing 12 for each cycle. A slender tube, reaching from the vertical chamber at the left, carries lapping compound onto the lapping wheel.*

## Exacting Machining Standards for Powerglide

vent change in form or dimensions later on. Accordingly, the big castings—transmission housing and case—as well as the smaller castings all are processed through the special equipment to be described here.

Although exceptional steps are being taken to keep parts clean by washing, Chevrolet has added a unique process for “de-siliconizing” the surface of all castings. In effect, this treatment dissolves all silica-sand in the surface of castings. Not only does this assure freedom from sand particles that may ultimately loosen, but the removal of abrasive material from the surface improves machinability to a remarkable degree and tool life is greatly extended.

The castings are first transported through the Holcroft furnace for stress relief. This unit is about 40 ft long and contains three heat zones. Maximum temperature is held at 1200 F, the cycle through the furnace ranging from  $1\frac{1}{4}$  to  $1\frac{1}{2}$  hr.

At the exit end of the furnace, the castings emerge in trays which are pushed to the station over the salt bath. Here the tray is picked up by a dip-and-rise elevator which lowers the parts into the bath and later moves up and out of the bath for immersion in other tanks.

The work is held in an Ajax-Hultgren salt bath furnace at a temperature between 800-900 F for only two minutes. This is sufficient to dissolve all traces of sand. Virgo salt, a special proprietary preparation supplied by the Hooker Chemical Co., is used in the bath.

From the salt bath the parts are immersed in a hot water rinse where the water is held at boiling, the object being to reduce the temperature of the castings gradually. Castings then enter an acid dip to neutralize the effects of salt bath treatment. This is followed by a hot water rinse, then an oil dip for protection.

It may be noted that the entire cycle—except for loading and unloading—is completely automatic and takes about  $2\frac{1}{2}$  hours from start to finish.

One of the major problems in the manufacture of an automatic transmission, incident to relatively high fluid pressures, is an adequate procedure for perfect oiltightness at the many joint surfaces. Chevrolet has chosen to meet this requirement by lapping the various surfaces.

Now lapping, in the usually accepted sense of the term, has not been considered a mass production technique. It is assumed to be time consuming and costly. Fortunately, the organization

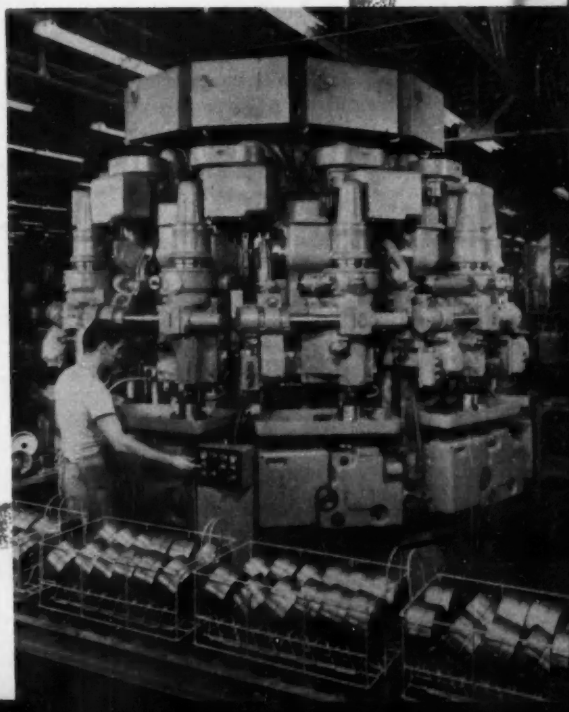
combed the potentialities and adopted an automatic machine method—developed several years ago (see *AUTOMOTIVE INDUSTRIES*, Aug. 15, 1948, for complete disclosure) which not only meets the requirements but compares favorably in cost and productivity with modern grinding methods. A number of the Crane Packing Co. lapping machines of 48-in. size are in regular use for lapping valve bodies and other large parts which require lapping on one surface. These are fitted with four fixtures, each holding more than one piece.

More recently, a much larger and improved version of the Crane machine, having a 72-in. table, was installed for lapping the servo cover face and front face of the transmission case. This will be recognized as a most unusual application considering the size and weight of the parts. One machine is fixtured for handling the servo cover face, another for the front face of the transmission case. Each machine takes 12 work pieces at a time.

In addition to the large parts mentioned above, smaller parts including the servo cover (two faces), front and rear pump bodies (both faces), and the rear

*(Turn to page 86, please)*

Here is the famous Fellows ten-station gear shaper set up for cutting internal gear teeth in the clutch housing.



# Quick

By Rebecca H. Smith

Chief Metallurgist  
The Turbodyne Corp.

Fig. 1—DPM indications of flaws. Cracks are shown in circles A and B.

HERE at the Turbodyne Corp., we have our share of problems in building and testing gas turbines. In order to be sure that each part is as good as it needs to be, all the conventional methods of inspection are used before assembly. Highly stressed parts must pass X-ray, ultrasonic, and magnetic or fluorescent penetrant inspection before they are accepted. However, there still remains the problem of inspection of the unit on the test stand between runs. So often we need to know, right away, whether a mark on a turbine blade is a scratch, a stain, or a crack. It is too expensive to replace every part under suspicion, but it may be dangerous to leave it in the engine for the next test. Yet the size and shape of many parts makes even the most careful visual inspection just a guess.

For this reason we became interested in surface inspection, in an effort to find tiny cracks before they grew large. A good deal of research and testing led to development of a new, general purpose process for detecting surface cracks. We call it the Dye Penetrant Method,\*\* or DPM,\*\* for short.

The theory behind this dye method is that some liquids will penetrate into cracks in metals, thus rendering them more easily visible. Dirty oil is often put on hot forgings for the same purpose; another application of this principle is the familiar kerosene-and-whiting inspection. We use a special

penetrating liquid which will enter even the finest discontinuities and will remain there when the excess is removed from the surface. In this penetrant is dissolved a red dye to provide a positive identification of surface defects. This dye penetrant is first applied to the surface to be inspected, and is left on the part for about five to ten minutes. It may be applied by dipping, spraying, or simply brushing on. Then all excess is washed off with a volatile solvent. Next, the developer is put on. This quick-drying solution has two functions: It provides a white background which is a good contrast for any indications, since they show up bright red; and it tends to draw out any dye

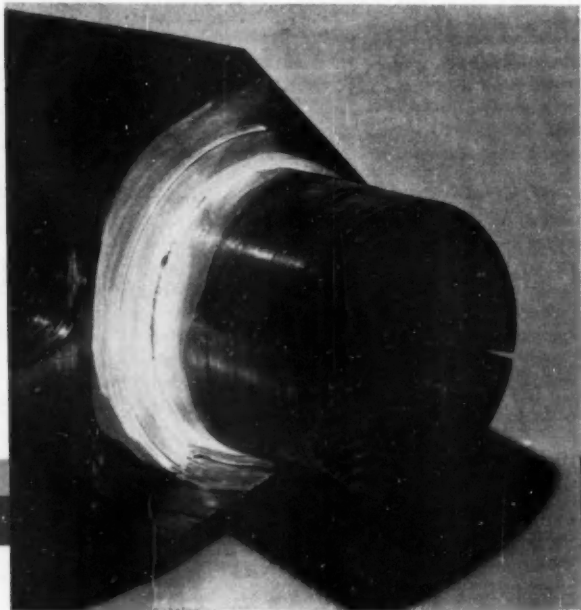


Fig. 2—This crankshaft has a bad crack which is made obvious with dye penetrant.

\*\* Patent Applied For.

# Inspection Method for Engine Parts

penetrant from the flaws. After inspection, a red line or red dots in a line indicate a crack. Scattered disconnected dots indicate porosity. It is possible to estimate the volume of the defect from the amount of "bleeding" of the dye penetrant.

Time and again, this quick process has enabled us to find surface cracks before they developed into anything serious. One such part appears in Fig. 1, the indications showing as dark lines and dots (A and B) in the white area. Visual inspection did not find these defects, so we tried to grind them out. After removing about 0.003 in. metal, we again used the dye penetrant and the red indications were stronger than before. We therefore took this part out of the engine, sectioned it, and found cracks that were dangerously long.

Because surface flaws stand out so vividly, this method of inspection is especially valuable where defects are obscured by sharp radii. Such automotive

parts as crankshafts, pistons, heads, connecting rods, and valves are quickly checked for surface defects. A quick determination of cracks is useful not only in manufacturing, but in service checks and repair work. The crankshaft illustrated in Fig. 2 has a bad crack right in the radius, which because of its location is not easily seen. However, after inspection with dye penetrant the crack is made obvious by the sharp red line.

Only those flaws which consist of an actual discontinuity on the surface can be found by this type of inspection. For example, internal porosity cannot be determined by this method unless the cavities extend to the surface. Inclusions will not give indications even when present on the surface of a part, because they are solid and do not offer any crevice for the dye to enter. But if an inclusion has caused a crack, the

*(Turn to page 90, please)*

Fig. 3—These two bad cracks in an oxygen regulator were not visible before DPM inspection.





# New Machines Expedite

**R**ECOGNIZED as one of the major producers of clutch release bearings for motor vehicles of all kinds, Aetna Ball & Roller Bearing Co., Chicago, Ill., has been widening its field of applications to include all types of standard thrust bearings, thrush washers, ball thrust retainers, special ball and roller bearings and precision parts. More recently the company embarked on the development of several new roller bearings of advanced design for tractors,

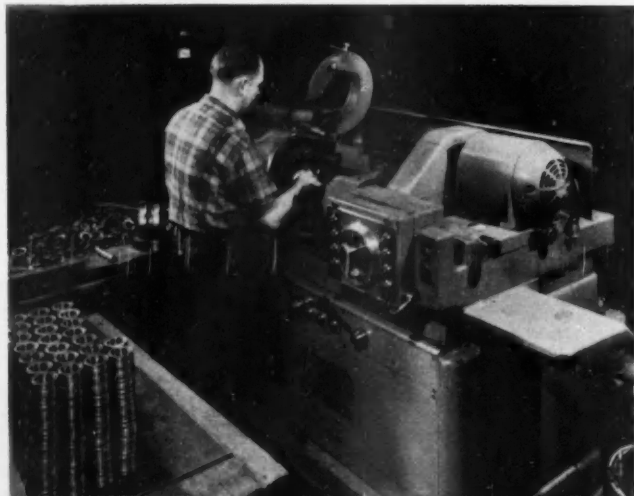
farm machinery and industrial applications.

A specialist in precision manufacture, the company is also undertaking the production of certain parts of automatic transmissions which largely require the same precise techniques employed in making file bearings.

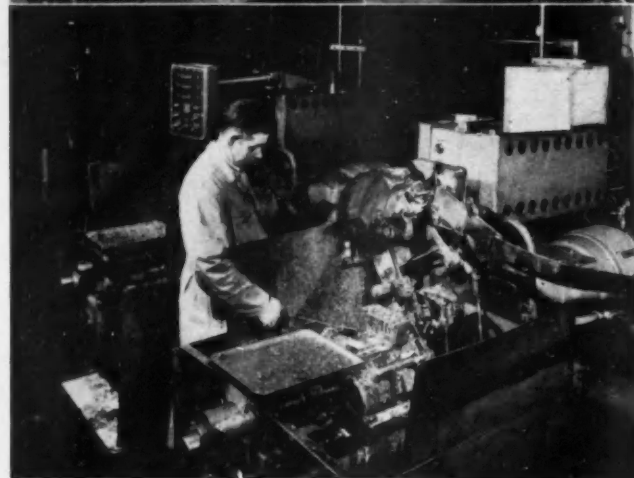
This broadening of activity is right in line with the postwar plant expansion program recently completed by the company, including a two-story addition to the former one-story factory, adding about 28,000 sq ft of floor space. At the same time the entire plant layout was rearranged to achieve greater compactness, smoother flow of operations and more integrated quality control.

Worthy of note too is the fact that Aetna has in operation a number of interesting pieces of production machinery of advanced type, some of which was first

By Joseph



(Top) The new high speed, high accuracy Heald internal grinder is seen in close-up here. The mechanism for setting the cycle and locking against tampering is in the box above the bed directly in the foreground.



(Left) Closeup of one of the two groups of two eight-in. Fay automatic lathes inter-connected to form a single automatic machine for finishing both sides of a race. The magazine feeding the second machine in the foreground may be seen at the left immediately near the operator. Finished races come out of the unit via the chute at the extreme right.

# Production of Bearings

## Geschelin

shown at the Machine Tool Show in 1947. Augmenting these facilities are some special machines now in the process of installation which are scheduled to become operational as soon as certain of the newly developed products are ready to go into volume production.

Even the casual observer will note some outstanding features of factory management of more than passing interest. First of all there is the newly installed quality control system, using control charts of simple form. These charts are employed on the majority of operations and go far to place quality on a high plane. At the same time quality control is actually a measure of economy since it reduces rejections sharply and assures customer satisfaction.

Another item of interest is the recent installation of a centralized system for filtering and rectifying

the emulsion used as a coolant in the grinding department. All of the production grinders—about 90 machines—are now located in a compact department and connected to the coolant system in the basement by means of piping laid in floor tunnels. Heart of the system is a Hoffman filtering unit similar to the installations in other plants in the automotive industries. The operation of this unit is under supervision

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(Top) Here is a good perspective of the two-spindle Blanchard surface grinder described in the text. The operator is loading races on the feeder table from which the parts enter the grinder table in the background. As races emerge from the grinder, they drop down the chute at the left of the feeder table, passing through the demagnetizer while enroute to the storage bin.



(Right) Latest piece of advanced equipment installed at Aetna is this big Cincinnati lapping machine, used for finishing automatic transmission parts. It produces a surface finish of five micro-inches or less.

# New Welding Developments Discussed at AIEE Conference

**T**HE second conference on electric welding held in Detroit April 5, 6, and 7 by the American Institute of Electrical Engineers in cooperation with the American Welding Society and the Industrial Electrical Engineers' Society of Detroit covered major aspects of problems of particular interest to automotive manufacturers—in body plants, automobile plants, parts and fabrication plants. It consisted of six sessions devoted to arc research, arc welding equipment, special welding processes, instrumentation, resistance welding equipment, and power supply.

According to Cobine and Gallagher, General Electric Co., new welding electrodes now are available which eliminate the erratic starting and instability often observed with pure tungsten electrodes used in inert-gas welding. These are made in two forms: A pure tungsten rod coated with either zirconite or thorium and a suitable binder; and a mixture of tungsten and thorium powder extruded into rods and sintered. Upon application of high-frequency current the arc is immediately established on the tip of the electrode. In addition, current range for a given electrode size is greatly extended.

Based upon tests made by the U. S. Navy, G. R. Wagner of the Bureau of Ships presented some desirable arc welding machine characteristics for consideration by the industry before definite Navy specifications are finalized. Among these are:

1. Maximum short circuit current, in load to short circuit test, should not exceed about 500 per cent of normal arc load setting.
2. Recovery voltage overshoot, following short circuit, should be around 150 per cent of normal arc voltage.
3. In addition, it is proposed that minimum voltage dip at the electrode, during the recovery period following short circuit, be not less than 80 per cent of normal arc voltage for the setting.
4. A maximum open circuit voltage of 80 volts also is proposed.

Welding characteristics of a mechanical rectifier type arc welder were described by K. L. Hansen who pointed out that this type of machine has been in use

for several years. It consists of an induction motor stator and rotor and, in addition to the squirrel cage, the rotor contains a dc winding connected to brushes bearing on the slip rings. The machine has a three-phase winding, voltage on each phase being approximately 50-v. When rectified and connected in series this produces an average output of 90 v direct current. Superimposed on this is a 240 cycle ripple of appreciable amplitude which has considerable influence on arc characteristics and can be made to produce a high degree of stability.

That induction heating can be used to join metals directly without the use of fluxes and solders was pointed out by R. J. Bondley, General Electric Co. With proper current control, as in resistance welding, induction welding becomes an inherently high production system, having high efficiency and low maintenance. Its use is usually limited to small parts of circular shape made from iron or ferrous alloys.

A new type of measuring device for controlling the quality of resistance welding — an ampere-squared-second indicator — was described by Millar and Kavaliuskas of General Electric. The maximum deflection of this instrument is a direct measure of the heat energy supplied to the weld.

A study of contact resistance in resistance welding operations, reported by Kouwenhoven and Sackett of the Johns Hopkins University, indicates that metal-to-metal contact generally occurs only at small subareas of the apparent contact area. Resulting contact resistance consists of two factors—a contact resistance proper, and the spreading resistance due to non-uniform current flow in the material. The report describes an experimental evaluation of spreading resistance as a function of the actual contact area.

The design of transformers for resistance welding machines, in the light of current knowledge, was described by Dean L. Knight, National

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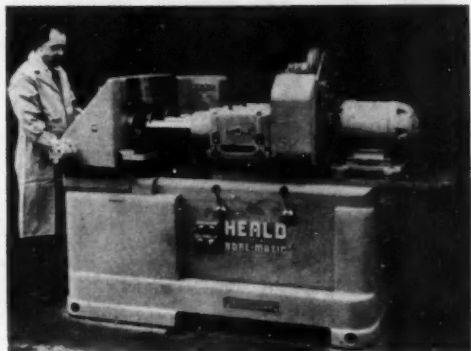
# • PRODUCTION • EQUIPMENT • PLANT •

# NEW NEW



FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 60

Model 425 end loading Bore-Matic, offered by Heald Machine Co., Worcester, Mass., which is similar to another co-announced Model 426. These machines differ from other Heald end loading models in the 221 and 321 sizes in that fixture and work are mounted on the bridge while the boring heads and motors are located on the machine table. The illustrated Model 425 is arranged with a stationary fixture; the similar Model 426 has the single exception of an indexing cross slide provided on the bridge for allowing loading of three work pieces while three others are being bored.

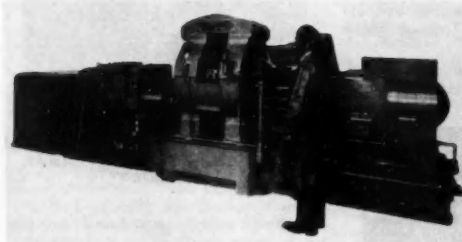


**J-59—Boring Machines**

## J-60—Water Pump Body Special Machine

A special high production drum type machine developed by Barnes Drill Co., Rockford, Ill., for a prominent automotive manufacturer accomplishes twenty-two operations on a water pump body by using two opposed hydraulic units

ing, facing, boring, chamfering, and hollow milling. Twelve holes and four surfaces are machined. The machine illustrated is performing the operations previously done on three special machines—with a proportionate reduction in handling, power, and maintenance costs and also a reduction in floor space. Stated production exceeds 90 pieces per hr at 80 per cent efficiency.



Barnes Drill special high production drum type machine for processing water pump bodies

with special heads and a seventeen station 27 in. indexing drum.

One head is arranged with 25 spindles and the other with 5 spindles. The unit with the 25 spindle head is powered by a 25 hp driving motor and 3 hp hydraulic motor. The unit with the 5 spindle head is powered by a 15 hp driving motor and 2 hp hydraulic motor.

Operations consist of drilling, ream-

Controls are interlocked for maximum safety.

## J-61—Burring and Chamfering Machine

A high speed precision burring and chamfering machine for various types

of gears is a product of the Sheffield Corp., Dayton, Ohio, to be had with either single or multiple stations.

Handling spur or helical gears, as well as multi-start worms up to 7 in. diam, it operates continuously at 300 teeth per min, or intermittently when equipped with an automatic work cycle to stop the machine after the part has been completely burred.

Cutters are sharpened by grinding the face angle, thus reducing cutter sharpening costs to about 1/100 when compared to the conventional pencil or



Sheffield high speed burring and chamfering machine, model 380

hollow mill type of form cutter, it is said. One or both flanks of the tooth form, including the root, may be chamfered with each stroke of the cutter.

## J-62—Tool and Cutter Grinder

Major improvement in the heavy duty ACE tool and cutter grinder, manufactured by the Oliver Instrument Co., of Adrian, Mich., consists in the method whereby the horizontal ram is mounted on a series of 1/4 in. balls



# NEW EQUIPMENT



For additional information regarding any of these items, please use coupon on page 60

contained in hardened and ground steel tracks. The unit is rigidly confined and the balls cannot move in any but a predetermined position. Spring pressure maintains the balls and track under constant pressure at all times which compensates for any wear, this construction eliminating friction.

With this Oliver method the oper-



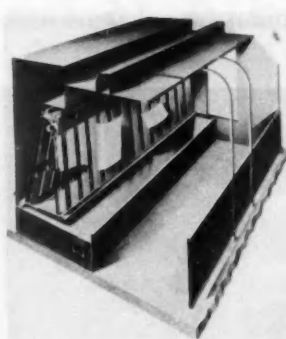
Oliver improved heavy duty ACE tool and cutter grinder

ator can feel the cutting action of the wheel and determine when the wheel is cutting to its maximum efficiency and accuracy, affording fewer burnt teeth, less grinding time, and more accurate cutters. The ease and simplicity of the movement of this improved ram requires only 6 oz of pressure on the operating hand lever to start the movement. It can therefore be operated by finger touch.

Another improvement in the heavy duty ACE is in the spindle drive, now equipped with vee pulleys and belt that provides three grinding speeds.

## J-63—Spray Booth and Sludge Segregator

To reduce cleaning and maintenance of spray booths and eliminate production interruptions for removal of paint-sludge from the surface of the solution in the charging tank, H. C. Mahon Co., Detroit, Mich., presents a new concept of overspray control and disposal.



Mahon hydro-filter spray booth for enamels, lacquer, paint and varnish—sectional view—showing working principle.

A vertically fluted "Hydraire" flood sheet, consisting of a staggered front and rear section, permits passage of air through the flutes and creates an even suction over its entire flooded area. This eliminates eddies, and produces an even flow of air throughout the working area of the spray booth. Front and back sections of the flood sheet are designed, coordinated and flooded so as to produce eddying traps which remove the bulk of the overspray at this point. The remainder of the overspray is struck from the air by torrents of chemically treated water in the rear of the flood sheet. Water eliminators, similar in design to the Hydraire flood sheet, form the rear wall of the washing chamber and effectively remove the entrained water from the air.

In this new spray booth, twice the amount of water is circulated at one-



Mahon automatic sludge segregator and unloader removes paint sludge from surface of spray booth charging tank as fast as it accumulates.

half the static pressure required in former models. The washing area has been increased four and one-half times. Density of paint overspray per cu ft of washing area is therefore reduced by a like figure.

Sludge disposal problems have also been solved in this new spray booth. Particles of paint forming into a sludge on the surface of the charging tank move constantly, due to an induced water current, toward and over a weir into a jet eductor chamber where the sludge is picked up as fast as it accumulates and conveyed hydraulically to an automatic sludge segregator and unloader.

The automatic sludge segregator and unloader may be located in any convenient place in relation to the spray booth. It traps the paint sludge removed from the chemically treated water and returns the water to the charging tank of the booth. This circulation is continuous while the spray booth is in operation. The unloading device, which functions automatically, dumps the accumulated paint sludge through a hopper into any portable receptacle for reclamation or disposal.

This new Mahon spray booth can also be furnished in the "downdraft" type, for floor conveyor systems, with Hydro-Filter units below the floor level of the booth.

## J-64—Gear Checking Equipment

An improved automatic checking recorder—Model MTR-1—for obtaining

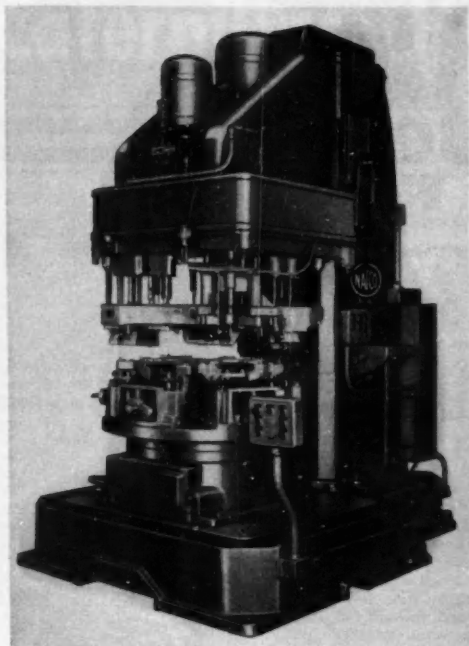


Michigan automatic checking recorder, Model MTR-1

permanent chart records of involute tooth forms, tooth spacing, leads, contours, thread forms, etc., has been brought out by Michigan Tool Co. of Detroit Mich. An accessory to Michigan Sine-Line gear checking equipment, the instrument automatically records up to 0.002 in. of error, both plus and minus, across its chart.

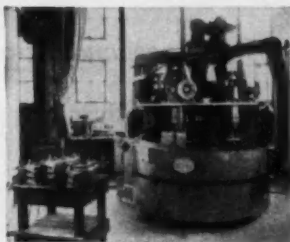
Among improvements are a selective two-speed chart drive and a new standardized interchangeable precision electronic gage head. The head mounts in





National Automatic Tool Co. automatic multi-operation Hole-steel Machine, for processing automatic transmission servo covers

legs attached to the side of the machine. The rotary table revolves around a central shaft. To this shaft four roller chains are geared, the chains extending outward and being connected to sprockets. Four vertical shafts, each 4 1/4 in. in diam and flanged at the bottom to receive the work-holding fixtures, are driven by the sprockets through roller bearings mounted on the rotary table.



Besly Roto-rotary grinder, No. 372-72 in.

tandem with the indicator on a checker. Either one head can be used and transferred from one checker to another or all checkers may be equipped with identical gage heads for plugging into the recorder.

Accuracy of the new checking recorder has been improved by the all-electric 2-speed drive and improved pen mechanism. Pen movement is 1/4 in. per 0.0001 in. of checker indicator finger movement. Chart drives give 1/2 in. of travel for either 2 deg or 1 deg of work rotation. The electronic amplifier is designed to take care of normal voltage changes so that such fluctuations do not affect the instrument's accuracy.

Mounted on rubber wheels, the recorder is completely portable.

### J-65—Multi-Operation Automatic Machine

Automatic multi-operation Hole-steel Machine announced by the National Automatic Tool Co., Richmond, Ind., in producing automatic transmission servo covers, performs 2700 operations per hr at each of four positions simultaneously — drilling, reaming, rough and finish counterboring, chamfering, spotfacing and tapping both sides of each part at the rate of 90 parts per hr. The operator simply unloads finished parts at Position 1 and transfers parts from position A to position B to complete both sides. The machining on both sides of the parts at four positions is simultaneous and completely automatic.

At Position 1, finished part is unloaded from location B, part from location A is transferred to location B, and part is loaded in location A. At Position 2, in location A, 8 holes 11/32 in. dia, are drilled; and in location B, 3 holes 1/4 in. dia, are drilled. Here also 1 hole 0.250/0.260 in. dia, is reamed and 1 hole for 10 by 24 tap is drilled.

At Position 3, in location A, 3 holes 11/32 in. dia are drilled. 1 hole for 0.2465/0.2475 ream through is drilled, and 1 hole for 11/16 by 16 tap, is drilled. In location B, 1 hole 0.838/0.839 in. dia, is rough C-bored, and 1 hole is chamfered.

At Position 4, in location A, 1 hole 0.2465/0.2475 in. dia, is reamed, 1 hole 1/16 in. dia, is spotface bossed, 1 hole for 0.250/0.260 ream, is drilled, and 1 hole 11/32 in. dia is drilled. Likewise, in location B, 1 hole 2 3/16 in. dia, is C-bored, 2 holes 1/4 in. dia are drilled, and 1 hole 0.838/0.839 in. dia is C-bored.

Finally, at Position 5, in location A, 1 hole 11/16 by 16 is tapped, and in location B, 1 hole 10 by 24 is tapped.

### J-66—Rotary Production Grinder

Charles H. Besly and Co., Chicago, Ill., has developed a No. 372-72 in. Roto-rotary grinder that production grinds gear casings, ball housings and other large castings ranging from 3 in. to 7 in. thickness.

Work-holding fixtures are suspended from a rotary table located in a stationary drum that is mounted on three

The work-holding fixtures are made from 1/2 in. thick mild steel plate with torch-cut openings to accommodate the units to be ground. Each work-holding station has openings to receive two castings. Pressure plates, equipped with spring-bearing studs, hold the work on the abrasive wheel, with the grinding pressure controlled by the operator to obtain the desired stock removal and flatness tolerance.

The work-stations are offset to allow oscillations of the castings to break both the inside and outside of the grinding wheel, dressing the abrasive disk as they grind. Both loading and unloading are handled by one operator.

### J-67—Deep Throat Punch Press



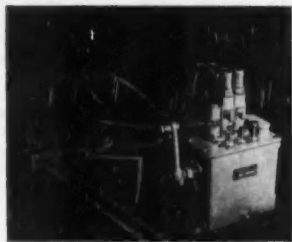
Recently added to the Rousselle line of standard and special punch presses is a new 25-ton deep throat press. Manufactured by the Service Machine Co., Chicago, Ill., this press has an 18-in. throat, a 14 by 20-in. bolster plate, operates at a speed of 125 rpm, and weighs approximately 3200-lb.

# NEW PRODUCTS

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 60

## K-120—Spray Lubricator For Conveyors

A system for spray lubrication of mechanical conveyors, brought out by Manzel Inc., Buffalo, N. Y., consists of a timing mechanism and spray head mounted on the conveyor, and connected to a Manzel automatic spray lubricator. As each roller of the conveyor strikes the timing mechanism arm it actuates an air valve, causing the lubricator to release an accurately aimed spray of oil directly onto the wearing parts.



Manzel force feed spray lubricator

The Manzel force feed spray lubricator is valuable for conveyor systems that pass through baking ovens, where it can be mounted so that the conveyor rollers are sprayed with a protective coating of oil immediately after leaving the oven. Its use permits continuous operation of conveyors formerly shut down periodically. Oil dripage has been eliminated; oil consumption drastically reduced.

Other uses are in press, shear, and similar operations for lengthening die life.

## K-121—Electric Industrial Lift Truck

Major changes in 12 models of its sit-down Skylift (BF) electric industrial trucks announced by the Automatic Transportation Co., Chicago, Ill., includes addition of two in. of lift to the entire series, except for Shipper models. The Skylift BF industrial truck now tiers to 132 in., with no change in the collapsed mast height of 83 in. Units

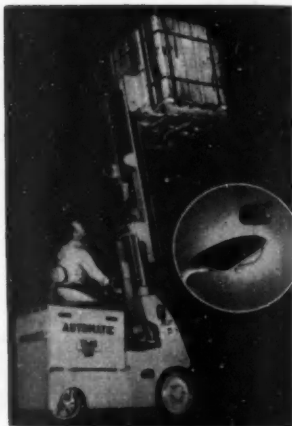
concerned are the BF-15, BF-20, BF-30, BF-40, Shipper-15, Shipper-20, and the same six models in the spark-enclosed Skylift line. They include trucks ranging in capacity from 1,000 to 4,000 lbs.

All electrical controls have been placed in a completely enclosed panel on the dashboard for greater accessibility, the entire control panel now being removable as a unit.

A new plugging relay in the BF series makes it impossible for the operator to reverse the truck before it comes to a stop. Silicone insulation, a feature of Automatic electric motors, withstands severe overloading even after exposures to temperatures of 300 to 400 degrees F., and combined with the new "plug-proof" feature, motors are said to become virtually "burn-out proof."

A larger seat, with foam rubber padding and adjustable back rest, retains its shape and cushioned comfort effect. A full side support prevents sliding while making turns. Both the seat and back rest have three adjustable settings.

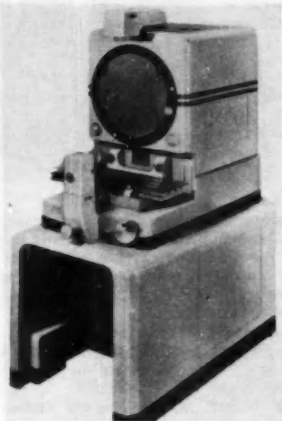
Redesign of the tilt ram includes self-adjusting packing that replaces the chevron type. It is now no longer necessary to disassemble the ram to make adjustments for wear. The Skylift BF series can be equipped with either solid or cushion type tires interchangeably.



Automatic Transportation's higher-lift electric industrial sit-down truck of Skylift BF series

## K-122—Optical Comparator

A contour projector which provides greater working space for efficient staging is produced by Eastman Kodak Co., Rochester, N. Y.



Kodak contour projector, Model 2

This new optical comparator, Kodak contour projector, Model 2, provides a full 14 $\frac{1}{2}$ -in. of work space between lamphouse and lens, regardless of magnification. In addition, the work table has been enlarged to 20 in. in length, and vertical travel increased from two to four in.

As in Kodak's earlier contour projector, eight-in. of space is provided between the object under inspection and the first lens of the projection system, but additional work space has been gained by relocating the lamphouse. The redesigned lamphouse can be swung down to permit surface inspection of long objects which extend far out in front of the instrument.

Surface projection with the new instrument is also made easier by a mirror attachment for surface or blind hole illumination in any of five planes.

A further change is the inclusion of a ball-bearing mounted, six-station lens turret permitting selection of any of six magnifications by turning a hand-

# "Caterpillar" Hydraulic Controls



## Use **VICKERS** BALANCED VANE PUMPS

Caterpillar No. 46 and No. 44 Hydraulic Controls use Vickers Balanced Vane Type Pumps for their dependable source of hydraulic power. These front mounted controls have a world-wide reputation for responsiveness, reliability, low maintenance and minimum down-time.

Vickers Vane Pumps have many advantages in addition to the hydraulic balance and cartridge assembly illustrated below. Their initial high operating efficiency continues because correct running clearances are automatically maintained. The no-load starting characteristic is an important feature in cold weather. Space requirement is small in proportion to hydraulic output. Working pressure is up to 1000 psi (continuous duty). Write for Bulletin 36-12 and Bulletin 49-52, which illustrate and describe the advantages of Vickers Vane Pumps for mobile equipment.

**TO HELP ASSURE:**  
**Fast, Responsive Control**  
**Long, Reliable Service**  
**Minimum Maintenance**  
**and Down-Time**

**VICKERS** Incorporated  
 DIVISION OF THE SPERRY CORP.

1428 OAKMAN BOULEVARD • DETROIT 32, MICHIGAN  
 Application Engineering Offices: ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES (Metropolitan) • MILWAUKEE • NEW YORK (Metropolitan) • PHILADELPHIA • PITTSBURGH • ROCHESTER • ROCKFORD • ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

3984

### **VICKERS**

#### **Cartridge Assembly**

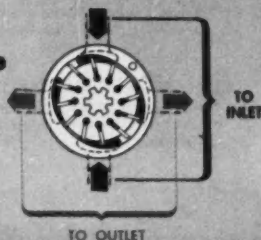
This cartridge contains all the pumping parts that move . . . none of them contact the housing. Inspection and removal of all working parts can be made without disconnecting piping or drive coupling.



### **VICKERS**

#### **Hydraulic Balance**

With this patented construction, bearing loads are cancelled out by equal and opposing radial hydraulic thrust loads as shown in diagram. The result is longer pump life with minimum maintenance.



# NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 60

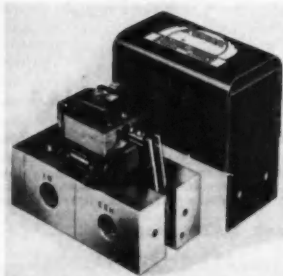
wheel. Lenses available for the turret are made in 10x, 20x, 31.25x, 50x, 62.5x, and 100x magnifications.

## K-123—Ring-Type Solenoid Valve

Lightweight solenoid valve produced by Galland-Henning Mfg. Co., Milwaukee, Wis., is operated by a small solenoid unit and differs from other solenoid-operated valves by reason of a solenoid-actuated pilot rather than the conventional direct pull of the solenoid on the sealing mechanism. Before the solenoid is energized, line pressure is always on the same cylinder port, with the other cylinder port open to exhaust. When the solenoid is energized, the cycle is reversed. The 3-piece valve body, machined from drawn aluminum, is easily dismantled. The valve is energized by a continuous duty standard solenoid unit unaffected by oil. It will function completely submerged, in oil. Sealing mechanism consists of a valve ring and Neoprene O-rings. The chrome-plated control shaft "floats" in O-rings and so requires minimum lubrication.

The Model SL solenoid-operated valve at 220 volts consumes only 0.96 amp yet develops a pull of approximately 3 lbs. It operates at air pressures from 40 to 250 psi; mounts in any position.

The valve weighs 5½ lbs, is 5½ in. long, 3 in. wide and 5½ in. high. At

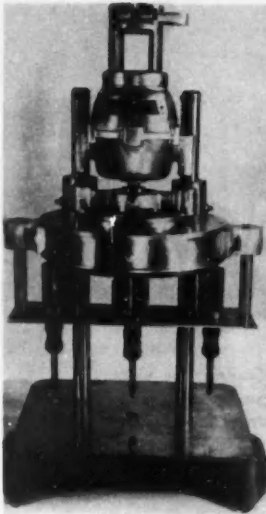


Nopak ring-type solenoid-operated valve, Model SL, offered by Galland-Henning

present the Nopak ring type solenoid valve is built in the ½ in. pipe size only, but is readily bushed down to ¾ in. or ¼ in. pipe size.

## K-124—Adjustable Spindle Multiple Head

Flexibility in drilling or tapping parts with hole sizes up to and including 5/16-in. in steel, on any type drill press, is made possible with the new convertible Ettco - Emrick adjustable spindle multiple head brought out by Ettco Tool Co., Inc., Brooklyn, N. Y. Rapid spindle adjustments can be made



Ettco adjustable spindle multiple head

from a minimum center distance of 1 1/16-in. to a maximum center distance of 7¼-in. Spindle can also be located at any point within a 3 5/16-in. diam circle.

The template method simplifies locating spindles for a given hole combination and changing their location from one drilling or tapping operation to another. With the bed plate, components are tied together like a punch and die. The adjustable spindle multiple head is available with 2, 3, 4 or 5 spindles.

## K-125—Selection Device For Ball Bearings

Sheffield Corp., Dayton, Ohio, has developed an air-operated Selectionaire

for matching races and balls of bearing assemblies so that radial play can be automatically controlled to any desired tolerance. This bearing gage likewise effects drastic reductions in



Sheffield ball bearing Selectionaire may be used with either column or dial type Precisionaire. The foot pedal actuates a device for equidistant spacing of the spindles to simulate the assembled bearing.

the manufacturing costs of finished bearings.

In operation the instrument tells before assembly exactly how much space is left between the inner and outer races for the balls. It is a process gage as well as an inspection instrument. With it, classification errors and their accumulation are avoided, and on a production basis.

It may be used as a matching gage, whereby inner and outer of nominal sizes but unclassified as to actual deviation, are taken at random. In such case the reading on the Selectionaire indicates the correct ball size to give an assembly of predetermined radial play.

Or, it may be used for selection of inner races to an outer race of known dimension and vice versa.

Again, if the assembling process calls for selecting races to match a standard size ball, the inner races are first segregated by classification. An inner race of known size is then used on the Selectionaire to which the unknown outer race is compared. The resultant reading indicates the actual inner race that should be used for the particular outer race and standard size ball to make up the assembly.

Where the guiding policy is to restrict the number of ball sizes, maximum radial clearance precision is obtained on the gage by selecting races to match. Where instead emphasis is placed on limiting the number of race sizes, the instrument permits quick selection of multi-size precision balls to match. Assembly time is cut, and teardown and rebuilding to obtain quality are said to be practically eliminated.



**TOOLS** FOR BORES IN 1/2" TO 1" DIAMETER

**TOOLS** FOR BORES IN 1" TO 2" DIAMETER

**TOOLS** FOR BORES IN 2" TO 4" DIAMETER

**TOOLS** FOR BORES IN 4" TO 6" DIAMETER

**TOOLS** FOR BORES IN 6" TO 12" DIAMETER

**TOOLS** FOR BORES IN 12" TO 24" DIAMETER

**TOOLS** FOR BORES IN 24" TO 48" DIAMETER

**TOOLS** FOR BORES IN 48" TO 96" DIAMETER

**TOOLS** FOR BORES IN 96" TO 192" DIAMETER

**TOOLS** FOR BORES IN 192" TO 384" DIAMETER

**TOOLS** FOR BORES IN 384" TO 768" DIAMETER

**TOOLS** FOR BORES IN 768" TO 1536" DIAMETER

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**TOOLS** FOR BORES IN 137015778499772148581595453067151533092743675904" TO 274031556999544297163190906134303066185487351808" DIAMETER

**TOOLS** FOR BORES IN 274031556999544297163190906134303066185487351808" TO 548063113999088594326381812268606132370974703616" DIAMETER

**TOOLS** FOR BORES IN 548063113999088594326381812268606132370974703616" TO 1096126227998177188652763624537212264741949407232" DIAMETER

**TOOLS** FOR BORES IN 1096126227998177188652763624537212264741949407232" TO 2192252455996354377305527249074424529483898814464" DIAMETER

**TOOLS** FOR BORES IN 2192252455996354377305527249074424529483898814464" TO 4384504911992708754611054498148849058967797628928" DIAMETER

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**TOOLS** FOR BORES IN 8769009823985417509222108996297698117935595257856" TO 17538019647970835018444217992595396235871190515712" DIAMETER

**TOOLS** FOR BORES IN 17538019647970835018444217992595396235871190515712" TO 3507603929594



# NEW PRODUCTS for AIRCRAFT

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 60

## T-11—Flareless Tube Fitting

The Aircraft Fitting Co. of Cleveland, Ohio, is presenting a flareless tube fitting that eliminates tube gouging and limits tube distortion. The flareless fitting requires no tube flaring.

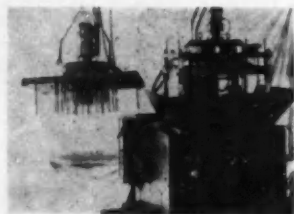


AFCO flareless tube fitting

permits installation without special tools and is adaptable to close quarter connections. Gripping action of the fitting sleeve forms a positive leakproof seal suitable for copper, steel, stainless steel, and aluminum tubing. The fitting is available in all standard shapes and sizes for tubing up to and including 1 in. OD. Combination shapes and sizes up to and including two in. can be furnished. All shapes—elbows, tees, crosses, etc.—are machined from forgings. All other parts are machined from bar stock. The flareless tube fitting meets all J.I.C. Hydraulic Standard requirements for industrial equipment and Specification AN-F-47.

## T-12—Multiple Drilling Machine

A special drilling machine built by Zagor Tool, Inc., Cleveland, Ohio, for



Zagor special multiple drilling machine having two drilling heads, one shown in off position.

drilling large numbers of closely spaced holes in large aluminum castings with minimum handling has been constructed on a principle of gearless drill heads.

The problem workpieces in this case consisted of castings to be drilled on two sides with an approximate average of 100 holes each side. Average size of the holes was  $\frac{1}{8}$  in., ranging from  $\frac{1}{16}$  in. to  $\frac{1}{4}$  in. in diam.

Crux of the problem was to furnish one basic machine upon which could be installed two different heads; one head for one casting part and one head for the other. In the resultant machine the drill head itself is driven with a hydraulic motor deriving its power from a 15-horsepower motor in the base of the machine. The feeding mechanism is accomplished with a vertical ram which presses the workpiece into the drills. Production rate on this equipment averages one completed part every two minutes.

The machine was originally designed for adaption of other heads and other parts to the same basic unit. Drilling machines of almost unlimited capacity ranging in number of spindles from 10 to 900 at one pass, on parts up to 30 in. in diam, are now being manufactured.

Three of these were built for the aviation industry, completely self-contained with hydraulic pump and coolant reservoir built in, solenoid operated control valve, and hydraulic feeds.

## T-13—Temperature Sensing Element



Totally enclosed resistance wire temperature sensing element developed by the Barber-Colman Co., Rockford, Ill., combines several temperature sensing elements in one unit and incorporates maximum protection in high velocity aircraft ventilating ducts with minimum sacrifice of sensitive response. Enclosure is pressure-tight and fitted with standard AN connectors. Increased temperature response approaching that of bare wire elements is obtained through a spring contact between the element and enclosure separated by a mica insulator. Standard units have a circular mounting flange but special mounting details can be supplied.

## T-14—Wing De-icing Compound

Stratofrost is the name of the new anti-frosting and wing de-icing compound released by Fine Organics, Inc., Aviation Chemicals Division, New York, N. Y. It is a clear, homogeneous liquid which may be diluted with fifty per cent water before use, to be sprayed or brushed on aircraft wings and tail surfaces either before expected frost, as an icing preventative, or on iced wing surfaces to melt the accumulated frost. Residual film inhibits icing during take-off periods. Stratofrost is also applied to surfaces before using wing covers to prevent their freezing to the wings and to make easy their removal. The product meets USAF specification No. 3609. Flash point is 85 F. It is available in 53 gallon and 5 gallon drums.

## T-15—Panel Type VHF Transmitter

Lear, Inc., Grand Rapids, Mich., has released a "Panellete" Type VHF transmitter for minimum space requirement in personal aircraft. The unit,



Lear "Panellete" Type VHF transmitter for personal aircraft, Model RT-10CP.

occupying a mere 1 11/16 in. square space on the front of an aircraft instrument panel, is designated Model RT-10CP. Radiated output of this Lear Model RT-10CP 6-frequency VHF transmitter is more than 2 watts. Weighing just 10 oz., the unit measures only 2 7/32 in. by 1 11/16 in. by 7 27/32 in. overall.

# NEW POWER UNITS FOR EX-CELL-O SPECIAL MACHINES

## CONFORM TO J. I. C. STANDARDS

This Ex-Cell-O Special Machine utilizes a new slide type hydraulic power unit for rotating and feeding the tools in the multiple spindle head. The new power units, in two sizes to accommodate motors up to 25 horsepower, are built in strict conformance with the standards established by the Joint Industry Conference of the automobile industry.

Ex-Cell-O Slide Type Hydraulic Power Units do not replace the standard Ex-Cell-O Quill Type Hydraulic Power Units which are used to drive less bulky multiple spindle heads or single tools. Both types of units often are used to good advantage on the same machine.

For economy in multiple machining operations such as drilling, reaming, spotfacing and counterboring, be sure to get a quotation on an Ex-Cell-O machine with standard, versatile Ex-Cell-O Hydraulic Power Units.



### FEATURES

- of Ex-Cell-O Slide Type Hydraulic Power Units
- 1. Conform to J.I.C. standards
- 2. Smooth hydraulic action
- 3. Simple construction—no gears
- 4. Adjustable automatic cycles
- 5. Self contained—can be re-used
- 6. Hardened, ground steel ways
- 7. Manifold-mounted hydraulic components
- 8. Positive stop in line with thrust

Ex-Cell-O Style #1 Slide Type Hydraulic Power Unit with motor mounted for horizontal installation. Same unit is mounted vertically on machine above.

## EX-CELL-O CORPORATION

DETROIT 32  
MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS  
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

# Publications

AVAILABLE

New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

## H-107 Precision Cutting Tools

Pratt & Whitney Div., Niles-Bement-Pond Co.—A comprehensive, 462-page hard-covered book, listing prices and sizes of P & W precision cutting tools and companion products, is available. The book is designed to facilitate the selection and ordering of taps and dies, screw plates, milling cutters, Keller cutters, reamers, punches, drills and miscellaneous tools. A new feature of the catalog is the inclusion of listings of solid carbide and carbide tipped cutting tools. Approximately 100 pages are devoted to handy tables and reference material.

## H-108 Industrial Lubricants

Acheson Colloids Corp.—A new 4-page pamphlet dealing with colloidal graphite as an additive to industrial lubricants describes a colloidal graphite dispersion in oil—"Oildag"—for blending with petroleum products; a

concentrated dispersion of colloidal graphite in mineral spirits, etc. The pamphlet also discusses methods of blending, means of calculating dilutions and advantages of heating during blending.

## H-109 Cylinders

Ledeen Mfg Co.—A 12-page bulletin, No. 500, gives dimensions and weights, ratings and limitations of the recently announced Medium Duty line of cylinders, as well as giving the same information for the Ledeen Heavy Duty and Super Duty Lines. Information affecting the selection of cylinders is included as well as illustrations and designs of rod and head attachments.

## H-110 Precision Casting—Microcast Process

Microcast Div., Austenal Laboratories, Inc.—"New Horizons with Micro-

castings," a 16-page booklet, includes many applications of precision castings, specifications and step-by-step explanation of the Microcast Process itself. There is a brief description of the background of precision castings and the part Austenal's Microcast Div. has had in developing the "lost wax" process and adapting it to modern industrial precision casting.

## H-111 Reinforced Hub Wheel

Norton Company — An attractive color folder describes and illustrates the Reinforced Hub Wheel. A complete description of the wheel is given, the jobs the wheel can do, construction details, recommended specifications, operating speeds, etc.

## H-112 Extrusion Presses

Lake Erie Engineering Corp. — A new bulletin illustrates and describes the latest equipment for four distinct fields of extrusion; includes presses for extruding metals such as aluminum, copper and new alloys; lead pipe and fittings, strip and solder; lead encasing for hose and electric cable; and carbon.

## H-113 Industrial Control Devices

Minneapolis - Honeywell Regulator Co.—Catalog 8303 contains information on industrial control devices for temperature, flow, pressure, liquid level and humidity. It presents more than  
(Turn to page 64, please)



THIS TIME SAVER COUPON is for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

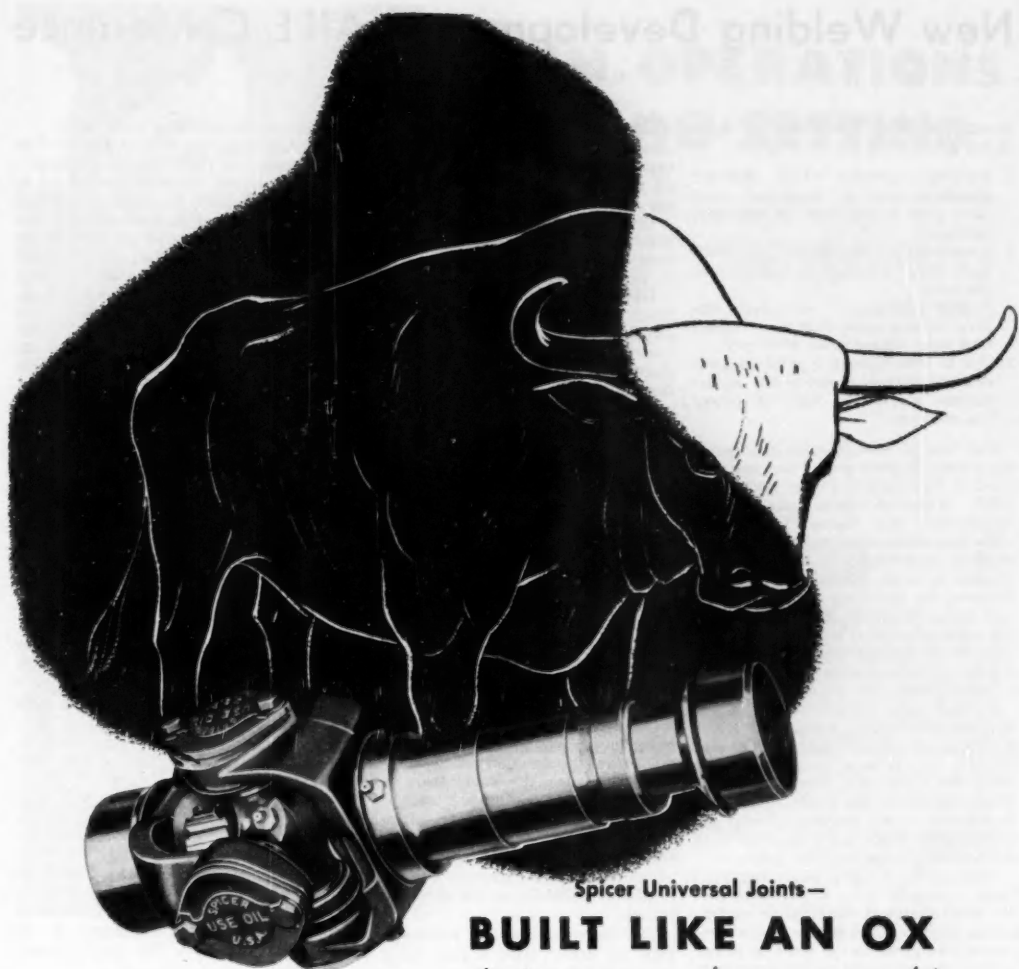
Readers' Service Department,  
Automotive Industries,  
Chestnut & 56th Sts., Philadelphia 39, Pa.

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Spicer Universal Joints—

## BUILT LIKE AN OX

*Not an ounce of excess weight*

Built for work . . . steady, safe, dependable. Big and broad in the shoulders, fortified by sinews of steel that handle heavy loads with ease and efficiency. Rigidity—the essence of accuracy—is assured by Spicer one-piece solid yoke construction. Spicer "built-like-an-ox" construction has patented features that will serve your equipment better . . . on the boulevard or in the backwoods. Spicer Universal Joints are built with a reputation to maintain . . . a 46-year service record unequalled in the industry. With this prestige we have an obligation to fulfill . . . in engineering, manufacturing and service of the highest order.

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**TOLEDO 1, OHIO**  
PARISH FRAMES  
STAMPINGS  
CLUTCHES

# New Welding Developments—AIEE Conference

(Continued from page 50)

Electric Welding Machines Co. Some of his conclusions are as follows:

1. Although present AIEE - RWMA standards can be improved, they have gone a long way to eliminate confusion.
2. Transformer impedance is much more important than is transformer efficiency.
3. Welder efficiency — secondary amperes vs kva input — is more important than transformer efficiency.
4. Due to intermittent type of load excitation, current is not nearly so important as in the case of power transformers.

The role of multi-transformer welding presses in mass production was outlined by Jack Ogden, Fisher Body Div., GMC. Although special purpose machines, they are frequently designed with interchangeable components, and welding transformers, too, must be readily interchangeable, compact, and designed for low duty cycle high current loads. Despite many limitations, the series connection is most frequently used, as it greatly simplifies machine design and maintenance, and reduces primary power requirements.

A new type of frequency-changer Ignitron tube (RMA designation 5822) described by R. R. Rottier, General Electric Co., is said to carry nearly twice the peak and average currents of the equivalent size single-phase tube. In addition, it will conduct without arc construction twice the peak current of the equivalent size rectifier tube.

Charles W. Wright, plant engineer, Delco Products Div., GMC, described the new electrical distribution system at the Dayton plant where special emphasis was given to the welding power system incorporating series capacitors at the main transformer primaries. Capacitors of sufficient size were installed to reduce transformer impedance of 5.5 per cent to less than 0.5 per cent. One transformer bank, installed to reduce total kva, has low reactance bus for risers and main feeders, with concentric cable as individual feeds to welders.

The presentation of technical papers was supplemented by actual demonstrations of electric welding equipment and methods at evening sessions sponsored by the Detroit Section of the American Welding Society. In the form of working displays of welding equipment and accessories, they served to introduce some products shown publicly for the first time, thus making the demonstration of more than ordinary significance.

A 75-kva Thomson Synchromatic flash welder—new model—displayed is air operated and designed particularly for joining non-ferrous metals, although it is equally adaptable for steel.

Lincoln Electric Co. featured a

unique welding positioner having universal mountings on Timken bearings, capable of positioning with freedom in all planes. This equipment is made by the Aronson Machine Co., Arcade, N. Y.

One of the latest developments from Westinghouse is the Selenium Rectifier used in conjunction with its Rectarc dc welding machine.

Graham Mfg. Co. displayed an automatic stud welding unit having magazine feed of the studs from an overhead Geneva movement and an automatic electrically controlled indexing table. A feature of this equipment is the ability of joining steel studs or non-ferrous studs to non-ferrous parts. Joining is done without use of flux.

General Electric showed one of the new heat meters described at the AIEE session, the ampere-squared-second in-

strument for checking heat input.

Another quality control device of recent origin is the Resistance Indicator, a cabinet type equipment developed by Sherman Electric Co., Warren, Ohio. It is designed to give readings of resistance in micro-ohms at the weld, at the electrical rings, at dies, or at copper bands for flash welders, seam welders, and tube mills during the welding cycle.

The new ac arc welding machine for Heliarc welding described in the AIEE transactions, was displayed by the Miller Electric Mfg. Co., Appleton, Wis.

Harnischfeger Corp., presented examples of its ac arc welders with saturable reactor control, described in one of the AIEE papers.

Altogether there were about 27 displays, only two or three being of static type.

## Air-Cooled, Two-Stroke Diesel

(Continued from page 36)

The valve has a diameter of 2.36 in., its lift is  $\frac{1}{2}$  in., and its open period 152 deg crank angle. The weight of the moving masses is 1.52 lb. With a total spring force of 485 lb, a maximum acceleration of 19,600 ft/sec<sup>2</sup> and a maximum deceleration of 660 ft/sec<sup>2</sup> (at 3000 rpm) the valve train withstood prolonged endurance tests without spring failures or wear. It is of interest to note that the acceleration curve is composed of a quadratical parabola in the accelerating region and a cubical parabola in the decelerating region.

The accessories of the full-scale engine are driven from a gear train on the clutch side of the crankshaft. There are two centrifugal blowers, one delivering the scavenging air, the other the cooling air. They are driven through resilient shafts in order to compensate for small irregularities in angular velocity, and through centrifugal clutches for protecting the blowers from damage due to rapid speed changes of the engine. Two six-cylinder Bosch injection pumps with mechanical governor and automatic Saurer timing device are provided. In addition to the pressure oil pump a scavenging pump is provided which forces the oil through an oil cooler located on the intake side of the cooling air blower.

The performance of the final single-cylinder prototype engine is shown in Fig. 3. These curves were obtained at a constant delivery ratio (cu ft of scavenging air at standard conditions per cu ft of displacement) and optimum injection timing.

Since all accessories were developed

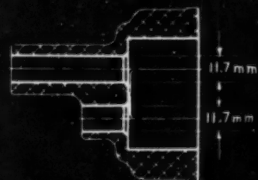
and tested separately it is possible to predict the performance of the full-scale engine, Fig. 4. These curves were calculated for the completely equipped engine, including a generator for lighting and charging the vehicle batteries, on the basis of the one-cylinder performance and the experimentally determined power consumption of all accessories. Figs. 3 and 4 represent figures applicable to continuous duty service as verified by endurance runs on the single-cylinder engine. The luboil consumption was around 0.01 lb/hp hr at full load. The ports remained remarkably free of deposits. No oil was pumped into the pre-exhaust chamber.

A full-scale engine was almost ready for assembly when combat action put an end to this extremely interesting development. It is regrettable that this engine did not get a chance to prove itself in actual service, particularly in view of its high rotative speed which many an engine designer still considers to be outside the limits of practicability for Diesel engines especially for those operating on the two-stroke cycle. Diesel engine design might have received a great stimulus if this Austro-Saurer engine had become a reality, but it still can serve as a reminder that the potentialities of the Diesel engine development are far from exhausted.

**Keeps You Informed**  
**AUTOMOTIVE INDUSTRIES**

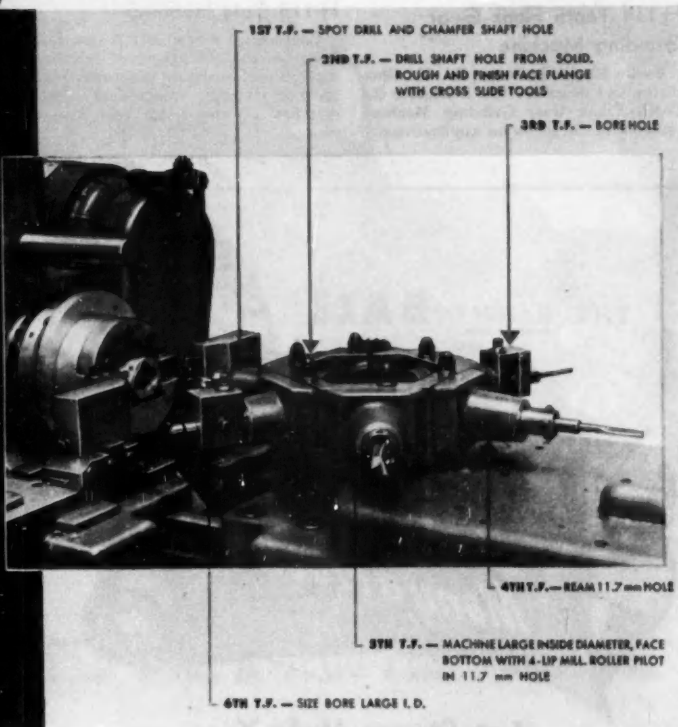


# TWIN OPERATIONS IN One SETTING



## ON THE POTTER & JOHNSTON 3U AUTOMATIC

Pictured is a typical tooling setup, turret face by turret face, for profitably machining aluminum oil pump bodies on the 3U/AUTOMATIC, as shown by heavy lines in the drawing. After machining the first bore during the first turret cycle, special fixture indexes work 180° for machining second bore during the second turret cycle . . . twin operations in one setting!



LET POTTER & JOHNSTON engineer a similarly profitable tooling setup for you — on any high speed, multiple operation work from a few ounces to several hundred pounds . . . for better work . . . and more of it . . . to greater precision with fewer rejects . . . at the lowest possible cost per unit. Our recom-

mendations will include detailed cost-and-time figures based on eliminating unnecessary work handling, combining cuts, reducing machining times. Just send us prints, or a sample of your work.

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50 YEARS' EXPERIENCE  
IN TOOLING FOR

*Precision + Productivity + Economy*

**POTTER &  
JOHNSTON CO.**

PAWTUCKET, R. I.  
subsidiary of PRATT & WHITNEY  
Division Miles-Bement-Pond Company



## Publications Available

(Continued from page 60)

100 different models of non-indicating electric, electronic and pneumatic controllers that have many uses in industrial applications.

### H-114 Tooth Flank Gear Grinding Machine

Cosa Corp.—Bulletin ZA-50 illustrates and describes the Reishauer ZA Tooth Flank Gear Grinding Machine. Information is given on applications of

the grinder, design of operation, control system, production capacity. Tables showing grinding time are included.

### H-115 Cold Heading

Continental Screw Co.—A new folder describes the advantages of cold heading, gives descriptive diagrams, essential information concerning correct methods of specifying cold heading, etc.

### H-116 Diesel Engines

Caterpillar Tractor Co.—A new 16-page illustrated booklet contains first-hand information on the company's latest Diesel engines, Models D397, D386, D375 and D-364. It covers the advantages and qualities of these Diesels and is complete with specification and performance charts.

### H-117 Planned Lighting

Benjamin Electric Mfg. Co.—A new, 32-page Planned Lighting Guide, is available. The Guide covers the Planned Lighting subject from the management viewpoint, breaking the problem into three major parts: economics, program development and equipment selection.

### H-118 Molding Powders

Rohm & Haas Co.—A new 16-page booklet gives information on Plexiglas acrylic plastic molding powders. The booklet is illustrated with photographs of molded end products, and covers the company's complete series of heat-resistant, medium-flow, and general-purpose formulations. Also included is a detailed table of properties for the various injection and compression molding powders manufactured by Rohm and Haas.

### Indianapolis Race

(Continued from page 32)

desired gear ratio in a matter of a few minutes time. A Ford truck ring gear and pinion are used. The brakes are 1949 Mercury for which aluminum backing plates have been cast. The wheels are cast magnesium and are driven by six pins; they are held on by a magnesium pressure plate and the familiar racing wing nut to allow for rapid changing.

Bud Winfield's two Novi entries have improved carburetion systems this year. The three Winfield float type carburetors in each car have been replaced with a variable venturi floatless type carburetor which will utilize the ram air. This is expected to give smoother intermediate performance with improved boost at the top end. Another modification in the Novi is replacement of the straight tube rear axles with a tapered tube axle. While adding no more weight, the tapered tube axle eliminates any localized stress at the edge of the semi-elliptic springs.

Another car expected to compete this year is the N. J. Rounds "REC Special." (See page 32.)

In the space of this article it is possible to touch on only a few of the new cars and on some of the old ones altered and modernized for more power and better handling. Should the track condition at Indianapolis compare favorably with last year, it is practically certain that higher speeds will be seen. But whether or not the speeds will be higher with more new cars built, and older ones more nearly perfected, the competition this year will almost certainly be closer and keener.

## THE RIGHT BALL



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Not only in precision ball bearings, but in countless other places, Strom has found that the right ball will do the job better. Maybe your problem can be solved with the use of the proper ball. Why not take it up with Strom.

Strom has been making precision metal balls for over 25 years for all industry and can be a big help to you in selecting the right ball for any of your requirements. In size and spherical accuracy, perfection of surface, uniformity, and dependable physical quality, there's not a better ball made.

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SECOND OF A SERIES of old car paintings in this colorful 1910 Pierce Arrow Special Touring Landau. Casually recommended for "traveling in Europe," this luxurious cruiser was made to order for an astronomical \$7200, packed 66 h.p. in her six-cylinder engine and carried seven passengers. Ventilated runningboard compartment accommodated dogs or cats.

Excellent color reproduction of this automobile for framing, will be sent to you on request. Please use your company letterhead. (Supply limited.)



## WHY COLOR HELPED SELL A \$7200 PIERCE-ARROW



YOU had to work hard to sell a \$7200 Pierce Arrow in 1910, particularly if you were talking to a "cold" prospect. Yet the creative salesman . . . the man who successfully sold these costly limousines . . . completely understood everything about his automobile, but especially did he comprehend those factors that appealed to the senses.

He understood, for example, the real value of color . . . a world of inspiration to the creative salesman . . . for color is powerful in its ability to enhance the value of a product. Color works in magic ways. It creates a radiant image which subtly plays upon the senses, arouses the imagination to intensify interest, and helps stimulate the buyer to act.

### RINSHED-MASON COMPANY

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"Proudly the automotive world displays the lustrous beauty of R-M Lacquers"

America's leading manufacturer of fine lacquers, enamels and undercoats for automobiles, trucks, farm equipment, appliances, and numerous other products of industry. We invite your inquiry.



# PARCO LUBRITE

smooths the early life  
of friction surfaces

**AIDS BREAK-IN**

**MINIMIZES SCUFFING  
AND SCORING**

**CONTRIBUTES TO LONG  
OPERATING LIFE**

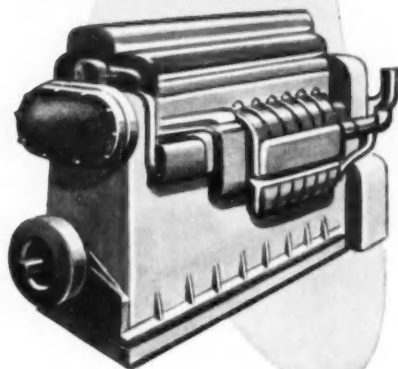
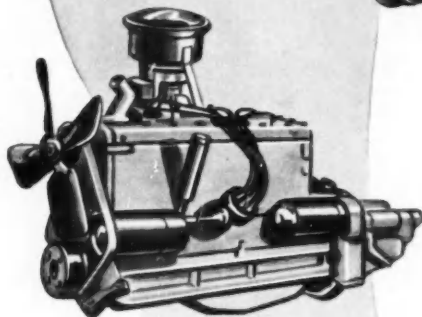
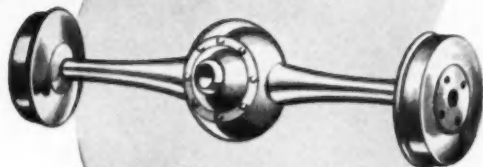
The first few hours of operation are crucial for friction surfaces. To protect the smooth surfaces and close fit of shafts, pistons, cylinders, gears and rods, leading manufacturers treat these parts with Parco Lubrite.

The Parco Lubrite coating, integral with the metal itself, is nonmetallic and oil absorbent. It holds lubricant, minimizes scoring and scuffing, aids greatly in the quick, smooth wearing-in of the surfaces.

The close, smooth seating, quickly attained by Parco Lubrite treated parts, contributes to the longer, more efficient life of assembly or engine.

## **ASK FOR DETAILS!**

Get the full story of Parco Lubrite's advantages.  
Send for technical bulletin today!



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**BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant • PARCO LUBRITE—Wear Resistant for Friction Surfaces**

## ASTE Annual Meeting

(Continued from page 41)

Some of these first applications must have been satisfactory, or at least have been encouraging, or the project would have stopped there. It is our experience, however, that few steel dies are built to the accuracy necessary to provide proper support to the carbide, and to deliver good performance in this type of installation.

The second approach used has been to make all the functioning elements of carbide but to follow the same design and construction quality previously used in the steel dies. This practice has worked out to the satisfaction of several users but it too has its drawbacks. We would bring the same approach to the manufacture of a carbide die that has been found necessary in the development of other carbide tools, and that is to design the job for carbide and to establish quality standards through the die that will properly support the carbide.

In this connection it should be remembered that the building of a carbide die is prompted by a desire or need for higher quality in the stamping, or longer performance of the tool, or both. In some way, it must better the job, or lower its cost. The inherent wear resistance of the carbide itself will deliver these improvements as far as the cutting edges are concerned. But the fit of the sections to each other and to the die set must be of far higher quality than has been customary in steel dies, if these cutting edges are to deliver all the performance of which they are capable.

Carbide dies require a maximum of strength and rigidity, and they are forced to operate today in press equipment that leaves much to be desired. We can't expect new presses designed for carbide overnight but we can take good advantage of existing press equipment by designing and building the best possible die. We have found that it pays off to establish the fits and joints throughout the die shoes, stripper plates, punch holders and in the die sections themselves to the accuracies usually required on gages. Dies built in this fashion have resisted the malfunctions of the punch press, feeding devices and take away devices which seem to fail more often with carbide dies than they formerly did with steel dies.

A very common question is, how many times more than a steel die does a carbide die cost? This question certainly has a bearing as to whether or not carbide will be applied to the job under consideration. There is, of course, no standard factor to apply since there is such a wide difference in the price of steel dies. If we agree that it is desirable to build the carbide die to

high workmanship standards and that it should incorporate the maximum strength, then it could cost four or five times as much as a steel die of cheaper construction. If, on the other hand, the carbide die is to replace a steel die built to the highest possible standards then its price could be as little as twice that of the steel die.

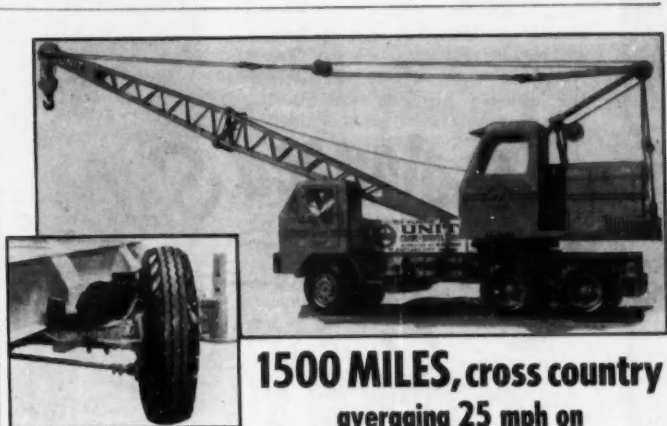
## Automation In Forging and Heat Treating

By Thomas E. Darnton

Supervisor of Standards  
and Willard L. Mantz

Supervisor of Production Engineering  
Forge Plant, Oldsmobile Division  
General Motors Corp.

**A**UTOMATION in the handling of steel forgings is a highly important phase of our operations at the



**1500 MILES, cross country**  
averaging 25 mph on

**TUTHILL**  
Alloy Steel **SPRINGS**

**Unit Crane & Shovel Corp.'s**  
**MOBILE TRUCK CRANE**

makes an eventful "uneventful" trip from Milwaukee to Salt Lake City, mounted on the best alloy steel springs . . .  
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Bring your special springing problems to Tuthill engineers. Their skill and long experience can help you do a good job better.

Special leaf springs designed to meet any requirement.



**TUTHILL SPRING CO.**

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Oldsmobile forge plant. In order to successfully handle over one million lb of forgings that are shipped from our plant each day it is vital that the individual movements of this material through the various forging operations is both well organized and makes use of the most modern type of materials handling equipment.

Steel bars are received via both railroad car and trailer trucks, in bundles equalling approximately five tons in weight and ranging from 10 to 15 ft in length. The bundles are unloaded by a magnetic crane and stored in our outside steel yard. It is our practice to carry approximately 30 to 45 days' re-

quirements of bar steel all of which is stored separately by heats and marked accordingly with paint. In most forging parts it is necessary to keep the heats intact and run the entire heat as a unit, so this storage is important in the separation problem.

When the steel is ready for processing it is moved by the magnetic crane to power conveyors which project into the steel yard. The bundles move inside the buildings, are broken, then rolled onto a gas-fired pre-heat table. From this point the steel moves directly through billet shears by a power-driven conveyor where it is cut to proper length.

Steel bars, after being cut to length, are placed in either a container or a rack in units of approximately 5000 to 6000 lb. Racks of billets for crankshafts are transported from the shearing operation into storage by a three-ton finger truck. The Oldsmobile forge plant has a fleet of 35 of these fork-type industrial trucks.

Crank billets, after shearing, are moved from storage to a position in front of the pusher furnace in which they are heated for forging. The crankshaft billet heating furnaces are capable of heating at a rate of 80 cranks per hr (150 lb each).

The operator unloads crankshaft billets from the furnace with a 12-ft pair of tongs counter-balanced on an overhead monorail. He moves the heated billets (2300 F) to the first hammer operation by pushing them along the monorail which guides them directly to the hammer. The handling of the crankshaft through the forging operation is similar to the unloading operation. By successive operations it is moved via tongs and monorail and finally placed on a rack at the finish of the last forging operation. The racks of finished forgings are now ready for the heat treat operation, and are transported from the forging department to the heat treat department by means of industrial three-ton fork trucks. The rack of 50 crankshafts is placed at the charge end of the heat treat furnace by the truck, then loaded on the furnace table with a small air hoist. The cranks rest on alloy shoes which are guided through the furnace on tracks.

The crankshaft furnace is one of three completely automatic units capable of handling and heat treating 100 crankshafts per hr each. Furnaces are operated with no manpower touching the crankshafts from the time they are placed on the charge table until they come out of the draw furnace. A quench arm lifts them from the alloy shoes and lowers them into the water directly below. The furnace is operated by limit switch control actuated by timers set for approximately 2.4 min per push. After proper quenching time has elapsed the automatic quenching arm redeposits the crankshafts on the alloy shoes on which they are then pushed into the draw furnace.

After the crankshafts leave the draw furnace they are handled manually by tongs suspended from a monorail onto the table of a straightening press. Here they are checked and straightened to 1/16 in., then placed on a monorail conveyor. This conveyor is approximately 1500 ft in length, and carries the crankshafts suspended from the flange on an acid-resisting alloy hanger. The conveyor passes through a water cooling tank to bring the forgings to approximately room temperature. This tank also removes a large portion of the loose scale. The conveyor then make three passes through a 75 ft pickle tank containing a 12 per cent solution of sulphuric acid at 170 F. All scale is removed from the forgings in

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The new Blacosolv is the most stable solvent we've ever offered for metal degreasing. Aluminum, steel, copper and precious metals may be safely and scientifically degreased with the same solvent.

Blacosolv contains a mixture of entirely new and different stabilizers. They are not alkaline materials which neutralize acid *after* breakdown. They are new stabilizers that *prevent* solvent breakdown and possible acid formation. Contains no alkaline materials that can be mistaken for stability . . . no masking agents are added.

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SOLVENT-VAPOR  
DEGREASERS



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**BEARING TROUBLES...**



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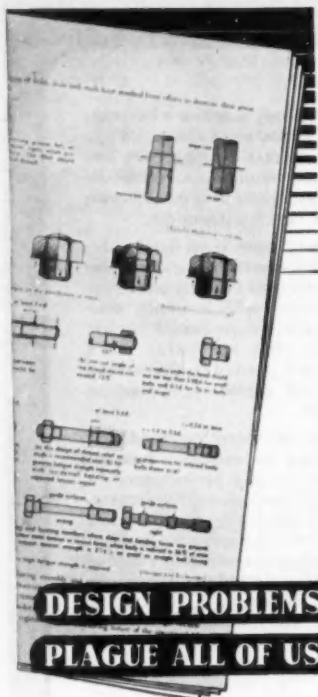
First, observe how it is designed—with an exceptionally large lubricant chamber for life-time capacity and retention of lubricant—with a sturdy, one-piece, T-Type oil-impregnated bronze ball retainer that maintains fixed alignment and provides the added smoothness and durability of steel to bronze contact.

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To serve well, a machine part—even when made of good steel, properly treated—must be properly designed.

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this pickling operation, and it is performed automatically without any manpower assisting.

After the crankshafts come out of the pickle tank, they pass through a spray rinse and neutralizing wash. The conveyor carries them to the final finishing department where the crankshafts are removed from the overhead conveyor and placed on the finishing slat conveyor. This power-driven slat conveyor is 80 ft in length and four ft in width. As the crankshaft is transported down the length of the conveyor

it is finished prior to shipping to the machine shop. The first operation is to remove it with the assistance of a block and tackle and place the crank in the mass balancing machine. This machine rotates the crankshaft, and the operator, by manipulating the machine, brings the crankshaft into dynamic balance. With the crankshaft in balance the centers are then drilled. The crankshaft is further carried on the conveyor to the final operation where it is checked for proper index and marked with starting points.

## Men in the News

(Continued from page 25)

Pacific Airmotive Corp.—W. R. Miller has been appointed Exec. Asst. to the Vice-Pres. and General Mgr.

Luscombe Airplane Corp. — H. L. Howard, Executive Vice-Pres. and Treas. of Texas Engineering & Mfg. Co., has been elected President.

Minnesota Mining & Mfg. Co. — Louis F. Weyand, in charge of Adhesives and Coatings Div., has been elected a director. Clarence M. King has been named Treasurer. He will continue as Asst. Secretary. George H. Schoettly and Edwin H. Church are new Asst. Treasurers.

The Budd Co. — Edwin F. Bates, formerly Mgr. of the Red Lion Plant,

has been appointed manager of the company's new Chase plant, Gary, Ind.

B. F. Goodrich Co., Hood Rubber Div.—Raymond H. Blanchard has been elected President of the division. He succeeds the late C. Lawrence Munch. J. M. Robbins has been elected Vice-Pres.-Manufacturing, of the Canadian company.

Morrison Steel Products, Inc. — Adolph S. Pezoldt, Jr., has been appointed Purchasing Agent.

Fairbanks, Morse & Co.—Two new Vice-Pres. have been elected. O. O. Lewis in charge of Sales and F. J. Heaslip, in charge of Purchases and Traffic.

## Not cut...Not cast... ...but Precision FORGED by AMGEARS!\*

Yes! Amgears is now supplying precision FORGED-TOOTH spurs, bevels, sprockets and clutches at savings in cost, compared with cut gears, up to 50 percent.

You can get precision forged gears from 3 diametrical pitch to approximately 10 diametrical pitch. Some of these gears are operating up to 600 rpm. and 800 fpm. pitch line velocity. They can be forged from any low or medium carbon and alloy-steel, heat treated or case hardened as desired.

Send blueprints or specifications giving shaft speeds, horsepower, center distances and gear ratios. Our designers will tell you promptly what Amgears can do to save you money or eliminate gear failures.

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Unparalleled production and design facilities for spurs, sprockets, helicals, worms and wormgears; straight and spiral bevel gears and racks. Write for helpful CASE HISTORIES! \*AM... Accurately Made

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INC.

CHICAGO 38, ILLINOIS

A SUBSIDIARY OF HUPP CORPORATION  
CONTRACT MANUFACTURERS  
Detroit • Cleveland • Chicago



"CONVERTING TO AIR  
IS A CINCH WITH  
BENDIX-WESTINGHOUSE KITS

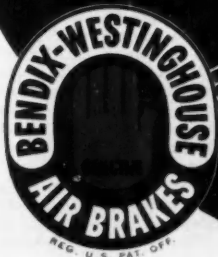


*And it Certainly has PAID OFF!"*

Thousands of independent truck operators, as well as the big fleet owners, have been saying the same thing for years. The quick, easy and inexpensive conversion to Bendix-Westernhouse Air Brakes pays off with new and greater brake economy, faster trip speeds and less maintenance—pays off with a soft, cushioned pedal pressure, yet with the most power-

ful and fastest action braking in existence—pays off with confidence in your brakes and less fatigue at the end of the run. Whether you convert your present truck to air brakes or order them factory-installed on a new one, you can always be sure of this extra efficiency and performance with Bendix-Westernhouse Air Brakes, world's safest power-to-stop.

THE BEST BRAKE IS



THE BEST AIR BRAKE IS

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY  
ELYRIA, OHIO

## Pneumatic Tools in Production

(Continued from page 37)

popular of the pneumatic tools in use. One reason is that with an air motor it is not necessary to keep the motor running continuously; thus the operator does not have to push down as he starts to tighten a nut. Again, the operator usually can handle the impact wrenches with one hand since the torque reaction is minimized with air-powered tools.

Pneumatic tool manufacturers offer impact wrenches in many sizes and

with attachments to best suit the wrench for the job, from driving nuts on  $\frac{1}{4}$ -in. bolts up to bolts of  $1\frac{1}{4}$ -in. in diameter. Different torque requirements are met by varying the air pressure furnished to the tool by means of a pressure regulator so stalling will occur at approximately constant torque.

By selecting the right tool, man-hour savings well in excess of 60 per cent are possible by the use of pneumatic impact wrenches. One example of sav-

ings on the Ford frame line is an impact wrench which tightens four shackle bolts at once. The wrench is arranged so that one turn works against the other. The operator experiences no torque reaction and the job is being done in a quarter of the time required when four operations were required.

The economies possible with pneumatic tools become even more pronounced on the Ford front fender assembly line, where small air tools are used and so of course are not suspended as the heavier tools are on frame and chassis lines. The light weight of these air-operated tools, their balance and ease of handling make them the natural choice for work where uniformity and speed are required.

Producing the compressed air for these tools and for many other uses of air in the plant are two two-stage air compressors of 1650 and 1000 cfm capacity each. A standby compressor of 250 cfm capacity is used in place of the larger units at nights and over weekends when large quantities of air are not required.

A six-in. main line leads from the compressor plant and is arranged in a loop system so that pressure will be even at all points along the system. There are 1631 ft of six-in. and 967 ft of four-in. line in the distribution system. With laterals, the Ford plant air lines would add up to more than two miles.

All service lines in the factory are painted with distinguishing colors. In addition to this identification, direction of flow and service carried is stenciled on all lines at 40-ft intervals. Pressure along the factory air lines is approximately 110 psi.

The importance of keeping air pressure at the right level is recognized when it is pointed out by Ford engineers that a 10-lb pressure drop from the pressure at which the tool operates most efficiently will cut output by 17 per cent. Greater pressure drops cut output more drastically.

The economies of compressed air-operated equipment extend to many other Ford operations other than portable tools. One of the interesting applications was on what is believed to be the first tire mounting machine in the automobile industry. An air piston pushes the tire onto the wheel while an electrically operated holder plate turns. The mounted tire is inflated with air during the period while the entire table completes its turn. Four tired wheels are on the table at one time, the fully inflated one being moved off as the one to be mounted comes on. The efficiency of the 15-year-old machine, which was devised by one of the Long Beach factory engineers, is such that it still holds its own with the more modern machines widely used by all automobile manufacturers.

There are numerous other shop-devised applications for compressed air. An example of one is the air piston at (Turn to page 74, please)

# GUNITE



## BRAKE DRUMS

### FEATURE NO FLEX

There is no flex on the cam and anchor sides of GUNITE Rib-Type Brake Drums. This means that linings wear evenly, last longer, brake efficiently. Also, burned spots are eliminated and drums last longer, require less frequent refinishing. GUNITES cost less in the long run because they give better service, require less attention. Breakage is eliminated by reduction of flex and by the high rate of heat conduction. Try GUNITES on your toughest runs. Let them prove themselves! Buy GUNITES—for better braking!



  
GUNITE BRAKE DRUMS . . . FOR TRUCKS, TRACTORS, TRAILERS and BUSES

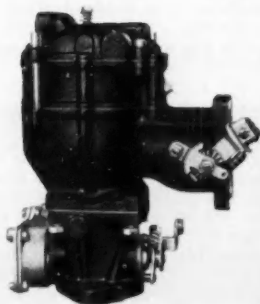




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## is the Engineers' Choice!



Just take a ride in a Zenith powered truck—and you'll know why Zenith is the engineers' choice for heavy-duty carburetion. You'll experience Zenith's smooth, fast acceleration, strong idling and freedom from stalling, its obedient response to your demands for power and speed. Then a look at the records will show that Zenith's unequalled performance *really lasts*—giving dependable and trouble-free operation year after year. For better carburetion in *your* heavy-duty equipment, insist on Zenith—the choice of experienced engineers for quality performance.

**ZENITH CARBURETOR DIVISION OF**

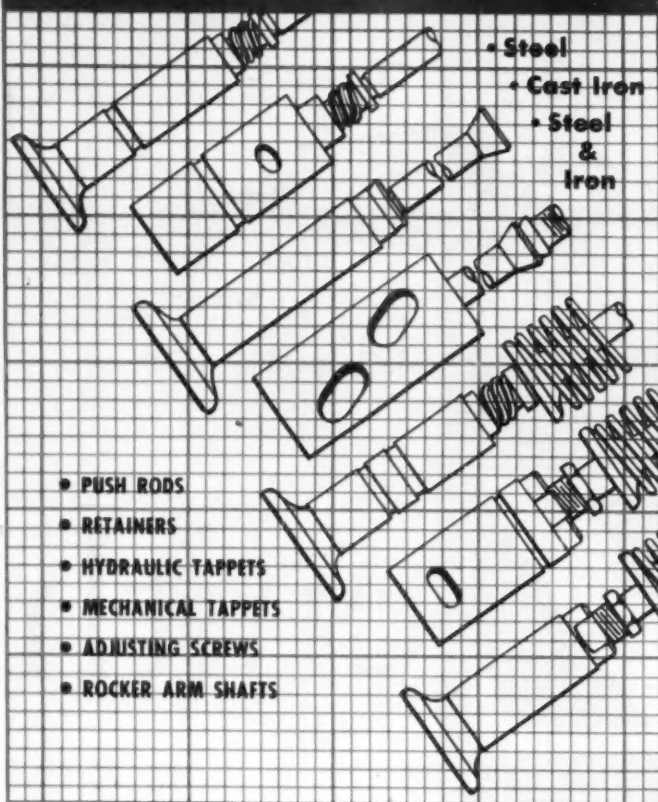
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the end of the body line. It is there to stop bodies should one come to the end before the attendant had returned the dolly used to move the last body off the line. Operation is by the touch of a lever by the attendant.

On the chassis line will be found a shop idea which saves time in brake fluid filling. Here an old gun welder has been adapted so that air piston will squeeze a fitting tight while the master cylinder is being filled. Slopping over, which occurred with manual filling, has been avoided and the worker at this station has his hands free for another operation during the filling process rather than just holding a line.

The several welding operations in the Long Beach factory depend upon compressed air in connection with fixture clamping and holding electrodes and work together in various ways according to the type and requirement of the welding operation. Close control of pressure desired in gun welding automobile body sections together, for example, is obtained by compressed air acting on hydraulic boosters at the ratio of 12 psi for one. This permits 1200 psi if that much is desired. Lesser pressures are exactly obtained by regulating the air pressure.

One of the uses for air other than the many which have been mentioned is for operation of hoists. Where ready power for heavy lifting with fingertip control is wanted, the air hoists are preferred. A typical use is in racking engines which have been unloaded from boxcars.

The two main spray booths for priming and color coats as well as the 11 other spray booths in use are of course dependent upon compressed air both in connection with pressure pits and agitating. Then again, air is used for operating sanders used in wet sanding on the primer coat. Because of the inherent safety of air tools, compressed air is the only power choice for such equipment being operated with water flowing over it.

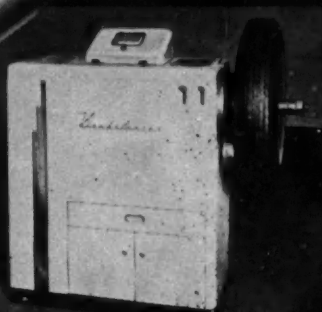
Application of sealing material, which is delivered to the plant in barrels, is dependent upon compressed air. An air pump forces the material out of the barrel and into the line so it may be applied with a flow gun. Air pressure is regulated according to the various types of sealing material used along the trim line and for the deadening coat on the body overhead after bonderizing. Where necessary, the barrels also are equipped with air-operated strippers.

## Hupp Corporation Loss \$669,268 for 1949

The Hupp Corp. has reported a net loss of \$669,268 for 1949. The previous year the company had a loss of more than \$380,000. Hupp has completed testing of electric window regulators and seat adjusters for cars and trucks and production will start when tooling and other facilities are completed.

*John Bean*  
**Saves \$1120  
per day**

**Hardening  
These Shafts**



*This John Bean Vibralancer—for checking out-of-balance automobile wheels, uses a TOCCO-hardened main shaft (shown above) to insure long life of wearing surfaces.*

## **with TOCCO\* Induction Heating**

● If your plant operations include hardening, brazing, soldering or heating for forging of ferrous or non-ferrous metals, savings such as experienced by John Bean Division of Food Machinery and Chemical Corporation can probably be accomplished in your plant, too.

**TOCCO is Economical**—Cost of hardening this shaft was reduced by \$2.00 when TOCCO replaced conventional heat-treating methods. TOCCO also made possible redesign of shaft which reduced its weight 12½ lbs.—a very important additional savings.

**TOCCO is Fast**—Entire heating and quenching cycles take only seconds, floor to floor time less than a minute. Production is 70 per hour, using 100 KW, 10,000 cycles.

**TOCCO Stops Rejects**—Distortion is no longer

a problem because automatic TOCCO doesn't heat the whole shaft—just those areas which require hardening. Rejects due to variation in heat-treating are eliminated because TOCCO is automatic—produces identical results—on two parts or two million.

**TOCCO Engineers**—can probably find applications in your plant, too, where TOCCO Induction Heating can increase output and cut unit costs. Such a survey costs you nothing—and may save you a great deal.

**THE OHIO CRANKSHAFT COMPANY**



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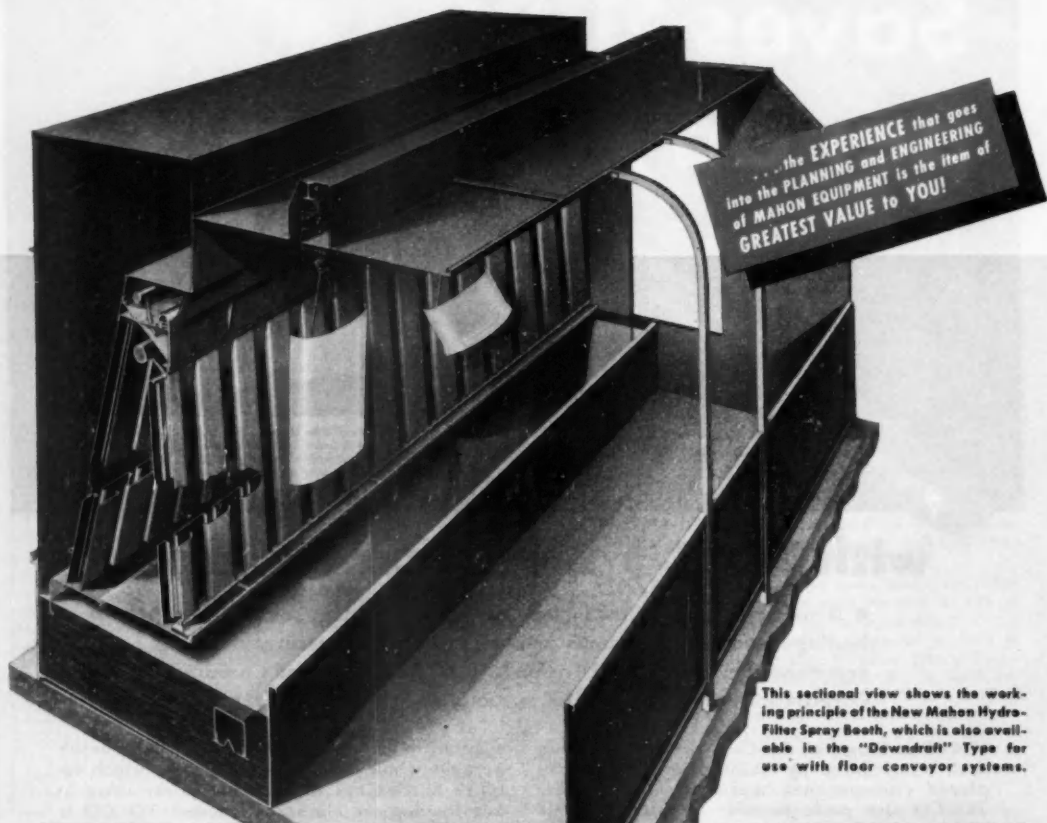
Position

Company

Address

City  Zone  State

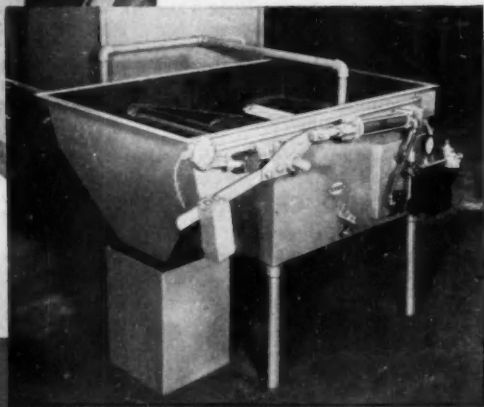
# ANNOUNCING



This sectional view shows the working principle of the New Mahon Hydra-Filter Spray Booth, which is also available in the "Downdraft" Type for use with floor conveyor systems.



The Mahon "HYDRA-Filter" Flood Sheet and the Eliminators in rear of the washing chamber of the Hydra-Filter Unit are removable in sections from the front. This facilitates inspection and cleaning if necessary.



Mahon Automatic Sledge Segregator and Unloader. This device automatically removes the paint sludge from the surface of the spray booth charging tank as fast as it accumulates . . . saves production time and man hours.

... THE NEW MAHON  
**HYDRO-FILTER SPRAY BOOTH**  
WITH THE NEW  
**"Hydraire"**  
**FLOOD SHEET**  
(PATENTS APPLIED FOR)

**Greatest Advance in Spray Booth  
Development in TWO DECADES!**

In an endeavor to reduce cleaning and maintenance requirements of spray booths to a minimum, and to eliminate the necessity for periodic interruptions in production to permit removal of paint sludge from the surface of the solution in the charging tank, Mahon engineers have come up with an entirely new concept in the principles of overspray control and disposal.

A new, vertically fluted "HYDRAIRE" flood sheet (Patents Applied For) consisting of a staggered front and rear section, permits passage of air through the flutes and creates an even suction over its entire flooded area. This eliminates eddies, and produces an even flow of air throughout the working area of the spray booth... working conditions are thereby vastly improved. Front and back sections of this new flood sheet are so designed, coordinated and flooded as to produce eddying traps which remove the bulk of the overspray at this point. The remainder of the overspray is struck from the air by torrents of chemically treated water in rear of the flood sheet. Water eliminators, similar in design to the Hydraire flood sheet, form the rear wall of the washing chamber and effectively remove the entrained water from the air.

In this new spray booth, twice the amount of water is circulated at one-half the static pressure required in former models. The washing area has been increased four and one-half times... the density of paint overspray per cubic foot of washing area is therefore

reduced by a like figure. Cleaning and maintenance problems are reduced to a minimum.

Sludge disposal problems have also been solved in this new spray booth. Particles of paint forming into a sludge on the surface of the charging tank move constantly, due to an induced water current, toward and over a weir into a jet eductor chamber where the sludge is picked up as fast as it accumulates and conveyed hydraulically to an Automatic Sludge Segregator and Unloader.

The Automatic Sludge Segregator and Unloader (Patents Applied For) may be located in any convenient place in relation to the spray booth. It traps the paint sludge removed from the chemically treated water and returns the water to the charging tank of the booth—this circulation is continuous while the spray booth is in operation. The unloading device, which functions automatically, dumps the accumulated paint sludge through a hopper into any portable receptacle for reclamation or disposal.

This new Mahon Spray Booth can also be furnished in the "Downdraft" Type, for floor conveyor systems, with Hydro-Filter Units below the floor level of the booth. Both types can be engineered to accommodate any product regardless of size or shape.

Mahon engineers will gladly explain, at your convenience, the many labor-saving advantages of this new, highly efficient, trouble-free spray booth.

**THE R. C. MAHON COMPANY**

HOME OFFICE AND PLANT, Detroit 11, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Pickling Equipment, Metal Cleaning and Rust Proofing Equipment, Dry-Off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Systems, and Drying and Baking Ovens.  
Also Core Ovens, Hydro-Foam Dust Collectors, and many other Units of Special Production Equipment.

**MAHON**



## Bearing Production

(Continued from page 49)

of the laboratory to assure complete control of filtering, as well as the proper maintenance of emulsion strength and quality.

Since one of the major activities in this plant is a well equipped press shop steps have been taken recently to develop an economical means of chip disposal. The larger chips and press trim are transported to the chip disposal unit where the material is crushed and ground into fine bits. These are then readily blown through a duct leading to a large storage bin.

From this point the chips are loaded into freight cars by means of a large electromagnet.

In view of the variety of operations involved in the manufacture of high grade bearings, we have arbitrarily selected some noteworthy operations which should be of general interest.

An example of automatic lathe operation of unusual character is found in the several batteries of race machining lathes. As illustrated, two eight-in. Fay automatic lathes are inter-connected to form a single auto-

matic machine in which one side of the race is finished in the first setting while the other side is finished in the second stage. Work is fed to the first machine from a magazine hand loaded by the operator. Each machine has a pair of forked arms at the work station; one fork reaches to the left to pick a piece of work from the magazine, then swings over to load the work into the chuck to start the machining cycle. As the cycle is completed, the other fork on the same pivot picks the work from the chuck and delivers it to the magazine of the second machine. Similarly, the second fork on the second machine serves to unload the completely finished piece.

The lathes use cemented-carbide tools of steel grade and the increased capacity derived from the tandem setup becomes apparent when compared with the performance of the conventional hand loading setups where two individual machines are operated by a single worker—doing one side in the first machine, then transferring to the second machine for finishing the other side.

Later these races are finish-ground on both sides in one of the familiar Blanchard surface grinders of two-head type. The interesting feature of this setup is in the provisions for materials handling. As illustrated, the operator loads the races with a race-way up, on the loading table in front of the grinder. The work is then moved onto the magnetic table on which the parts are held securely for the first grind. The table is then demagnetized and the work permitted to slide out into a chute on the side of the machine. As the work drops down the chute it passes through a demagnetizer mounted directly over the chute, then onto a flight conveyor which carries the work through a washer. Passing out of the washer, the conveyor drops the parts into a bin.

The foregoing sequence of events takes care of one side of the race automatically. When the bin has been loaded sufficiently the operator removes the parts and reloads them on the loading table with the flat side up. The cycle then repeats as before except that this time the parts stored in the bin are ready for final inspection and routing to the assembly department. Stock removal ranges from 0.012 to 0.015 in. per pass.

One of the most advanced operations in this plant will be found on the Cincinnati Centerless Lapping Machine. This is arranged to centerless lap automatic transmission parts at a high rate, holding surface finish to five microinches or less.

For internal grinding of bearing parts the company uses a large number of the familiar Heald Gage-Matic and Size-Matic machines. More recently, however, they placed in operation the Heald Model 27 Gage-Size internal grinder (See page 48.) The machine has markedly greater productivity and

(Turn to page 80, please)

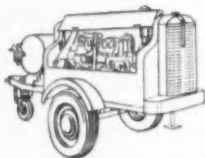
## 2-WAY BOOST TO BETTER COMPRESSOR PERFORMANCE



### RADIATORS AND INTERCOOLERS



Portable air compressors must work hour after hour under constant load — in spite of stifling summer heat. That's why leading manufacturers of these units choose Yates-American Radiators for the important task of cooling both the hard-working engines and the air they compress.



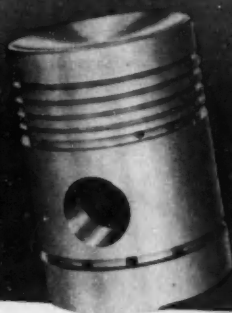
Yates-American radiators are specially designed for each application. By working in close cooperation with manufacturers' engineers, Yates-American pioneered the development of satisfactory intercoolers for the air compressor industry.

California Representative: E. E. Richter & Son, Emeryville, Cal.

## YATES-AMERICAN MACHINE CO.

HEAT TRANSFER PRODUCTS DIVISION BELLEVILLE, WISCONSIN





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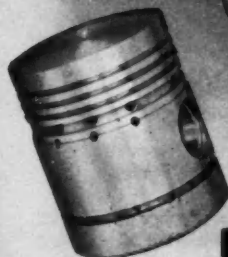
Steel Truss



Turbulator head



T-Slot



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for 30 Years

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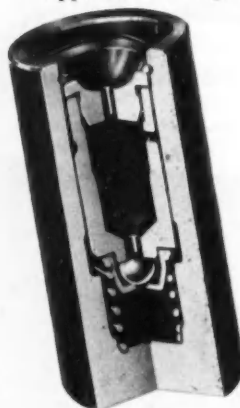
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2. Longer valve life.
3. Smoother engine performance.
4. Absorption of cam tolerances and runouts.
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### DIESEL EQUIPMENT DIVISION

General Motors Corporation

GRAND RAPIDS, MICHIGAN

will hold work even more accurately to size. One of its major features is an external control cabinet containing the adjustment for cycling and feed rate. These controls are adjusted by the tool setter and then locked so as to be free from unauthorized tinkering. The machine will then hold to the established cycle and feed rate without deviation.

Van Norman race grinders have been an item of standard equipment in this plant for many years. Constant experimentation recently led to an important improvement which is said to increase wheel life by three times and produce a better surface finish. What they have done, essentially, is to provide a full stream of grinding emulsion on the wheel during the grinding cycle. It is a principle in bearing manufacture that only dry work can be finished to the required surface finish. With the new arrangement coolant flow is automatically controlled in such fashion as to cut off sharply to permit the last three oscillations of the grinding wheel to finish dry. This assures the fine finish that is specified. The adoption of wet grinding in this case made possible a change in wheel specifications and the combination results in trebling wheel life.

The company is currently installing a battery of new Van Norman race grinders of small size to handle small parts economically.

Finally it is of interest to comment further on the quality control system in effect here. In the first place, the company uses a system of floor inspection in which inspectors are assigned a specific area to patrol. As a matter of routine the inspector makes his rounds five times a day and takes samples of work coming off the machines at the time. Gaging and inspection is done in the inspection department. The inspector then posts the results of his check directly on the control chart on the machine. If work is proceeding satisfactorily, the operator continues without interruption. However, any evidence of lack of control may cause the inspector to stop the machine immediately.

At the same time the operator at each machine is provided with his own checking equipment and thus watches machine operation continually. He is in position to stop the machine and call for a tool setter whenever there is evidence of trouble.

Bearing races are tested in a sound booth before they are OK'd for assembly. Here the races are run against a master raceway. Not only does this certify races for assembly but it also constitutes another control on the operation of the race grinders. Any evidence of noise reflects some change in machine condition that demands immediate attention.

Reaching the assembly department the bearing components undergo their final preassembly inspection, are then assembled and again sound tested under actual operating loads before being approved for shipment.

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BEARINGS

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Mogul

## Sleeve Bearing Torture Chamber

Here, bearings are given really brutal tests. In just a few hours, they get a tougher workout than they would get in years of normal service. This "third degree" treatment makes any bearing tell all about its performance capabilities.

Can it stand high heat? . . . heavy load? . . . high speed? . . . pounding? . . . The research engineer answers all of these questions, and more.

Because he knows that there is no *universal* bearing material, the research engineer must establish fields of usefulness for many bear-

ing alloys. Working within the limits of each, he specifies which will be best for the particular set of operating conditions to be met.

He has the answers to questions that may not be asked by the engine builders for several years. This is as it should be. The research engineer

must think ahead, plan ahead, and have tomorrow's sleeve bearings ready today!

Our engineers have had millions of dollars' worth of experience—take advantage of it in *your* sleeve bearing requirements!

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FOR SPEED  
AND  
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FOR  
HEAVY LOAD  
SERVICE



FOR  
VARIABLE  
SPEEDS



FOR  
HEAVY  
LOADS



## Inspection of Connecting Rods

(Continued from page 33)

ings, then subject them to magnetic particle inspection in an automatic Magnaglo unit.

The elimination of pickling and individual piece inspection alone has released at least five men per day for other productive work. In addition, the procedure assures the maintenance of rigid inspection standards at an exceedingly high rate of output. Another plus value is that shot blasting greatly increases the endurance limit of the connecting rod.

In operation, after forging and heat treating, the connecting rods are transported to the machine shop where they are shot blasted in the continuous American Wheelabrator Tumbblast machine. Here, in a fast, continuous cycle, light rust and occasionally light heat treat scale are removed with No. 230 chilled iron shot. This operation also has the effect of enhancing endurance limit to a measurable degree.

Following this the forgings are subjected to fluorescent magnetic particle

inspection in the Magnaglo unit shown here. As illustrated, the machine is provided with a variable speed conveyor with fixtures for holding the forgings. The forgings are loaded by hand at one end and as they move along the conveyor, they are magnetized at the station at the center, sprayed with a fluorescent solution, then inspected in the booth at the other end of the unit. At this point each forging is rotated as to present the entire surface to the view of the inspector. Meanwhile the work is scanned by "black" light from the lamps mounted directly overhead. Because of the automaticity of the set-up and the speed with which the unit can be operated in regular production, it is feasible to inspect critically up to 2100 pieces per hour on one unit. Accepted pieces normally drop into a chute and thence into shop containers. Rejects, on the other hand, are deflected through a chute at the other side for salvage. Due to the low amperage and the use of alternating current, the work does not have to be demagnetized until parts are completely machined and inspected.

An important feature of the Magnaglo procedure is that the operator rejects all parts having any indications whatever, in the interest of speed. Later these parts are again inspected, this time being separated into two groups; those which can be accepted as meeting the written specifications, and those which do not meet specifications. Parts in the latter group are then scrapped.

The standard specification on connecting rod inspection includes about 15 pages covering such details as method of magnetization, type of current, value of amperage, concentration and application of the magnetic particle suspension, etc. Since magnetic inspection produces indications of even minute surface imperfections, perhaps the most important phase of the specification is the specific description of the variety of indications with instructions as to those which are perfectly acceptable and those that are not. These instructions cover the size and location of such indications.

To cite just one example, the specification states in the category of acceptable indications that "any single longitudinal indication not exceeding two inches in length, and not within one inch of either end of the channel, is acceptable." All other types and locations of indications are to be rejected.

As examples of acceptable and not acceptable indications, Fig. 1 shows an acceptable type of indication; while Fig. 2 shows one type that is cause for rejection.

It may be noted that the principle of inspecting forgings before machining is responsible for other important production economies by screening most of the causes for rejection at the source. Consequently, the machine shop is relieved of the burden of rejections at the end of the line where the cost of the rejects includes not only the forging but production costs as well.

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# HARDENED and GROUND PARTS

for over 40 years

**S**INCE the day of the duster and goggles, The Brown Corp. has meant highest quality precision parts for the automotive industry. Today, Brown Parts serve trucks, tractors, trailers, buses, axle builders, off-the-road machines and Diesel locomotives. The production methods and facilities we have developed are unexcelled—uniform product quality is assured—deliveries are reliable—service is efficient. Ask any of our long list of satisfied customers throughout the industry.

For further information about our specialized production of hardened and ground automotive and industrial parts, just drop us a note. We invite an opportunity to quote on your work.

*Harry W. Brown*  
PRESIDENT



KING PIN

Parts include . . .

- King Pins
- Shackle Bolts
- Shackle Pins
- Brake Anchor Bolts
- Countershafts
- Idler Shafts
- Stub Axle Shafts
- Steering Ball Bolts
- Beam Bolts and Bolts
- 5th-Wheel Rocker Shafts
- Wheel Studs
- Water Pump Shafts

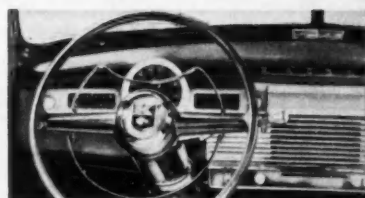
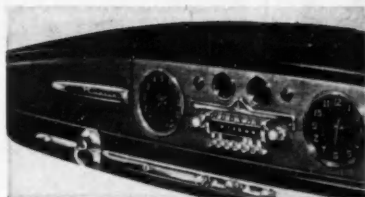
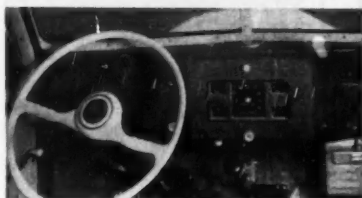
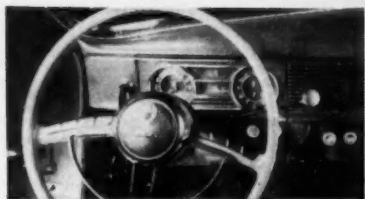
. . . anything in the hardened and ground line, of any analysis steel, up to 4 1/4" diameter.

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for the Superiority of



## DASHBOARD INSTRUMENTS

**King-Seeley electric dashboard instruments have long been superior in the automotive field because:**

1

Their performance is always reliable—gives the car owner no cause for a gripe.

2

All connections are made with standard electric wire, thus they are easily installed by production line methods.

3

No tubing is needed. Wires are used instead. Consequently the danger and annoyance of broken tubes are eliminated. No tubing holes in the dash. Engine noises cannot be telegraphed to the dash as they are by tubing.

4

The vehicle manufacturer can always depend on strict adherence to the delivery schedules of King-Seeley instruments.

5

King-Seeley research engineers are constantly searching for a way to improve the effectiveness, dependability, and economy of these instruments.

In the last seventeen years 50,000,000 K-S instruments have been installed in automobiles and trucks. For more detailed information, write to King-Seeley or ask for a representative to call.

**KING-SEELEY CORPORATION**  
ANN ARBOR, MICHIGAN

PLANTS AT ANN ARBOR, SCIO, AND YPSILANTI

## Rounds Racer

(Continued from page 32)

condition of the Speedway surface. The torsion bar is lightweight and shock absorbers are heavy duty Houdaille hydraulics. Complete spherical ball joints are included on all radius and steering rods.

Sodium cooled exhaust valves, similar to the type used in aircraft engines, are planned. The Rounds car may be the only one in this year's race with this type of valve.

The builders of the Rounds car feel that advanced materials and design give them a better functioning car than the previous rear engine design entries.

## BOOKS

**SYMPOSIUM ON METALLOGRAPHY IN COLOR.** This symposium, presented at a recent A.S.T.M. Annual Meeting, has just become available in printed form (Special Technical Publication No. 86). Sponsored by A.S.T.M. Committee E-4 on Metallography, it presents the latest thoughts and practices in this field in which there is a steadily growing interest. Leading authorities prepared the papers, with discussions of the various techniques used to record the characteristic colors seen visually.

Copies of this 80-page symposium, including 10 insert color plates, can be obtained from American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa., at \$4.50 each, heavy paper cover, or \$5.15 each, cloth cover.

## Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

Business activity in general declined slightly during the week ended April 8. Department store sales, crude oil output, and construction were higher than in the preceding week, while electric power production, railway freight loadings, and bituminous coal production declined. The *New York Times* index of activity for the week ended April 8 stands at 156.3, as compared with 156.6 in the preceding week and 146.7 a year ago.

Sales of department stores during the week ended April 8, as reported by the Federal Reserve Board, equaled 320 per cent of the 1935-39 average, as compared with 301 in the week before. The volume of sales, for the second consecutive week, showed no variation from the corresponding distribution in 1949. The total in 1950 so far reported was two per cent less than the comparable sum in 1949.

Electric power production declined during the week ended April 8. The output was 10 per cent above the corresponding amount in 1949, as compared with and advance of 9.9 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 100,129 cars, 2.8 per cent less than the figure for the week before and 7.6 per cent below the corresponding number recorded in 1949.

Crude oil production in the week ended April 8 averaged 4,997,600 barrels daily, 124,650 more than in the preceding week and 23,550 above the comparable output a year ago.

Production of bituminous coal and lignite during the same week is estimated at 11,425,000 net tons, 515,000 less than the output in the week before and 28,000 below the corresponding quantity in 1949.

Civil engineering construction volume reported for the week ended April 13, according to *Engineering News-Record*, was \$177,568,000, or 42 per cent more than the preceding weekly figure and 12 per cent above the comparable sum in 1949. The total recorded for 15 weeks of this year was 39 per cent more than the corresponding amount in 1949. Private construction for the period was 61 per cent above that a year ago, and public construction increased by 18 per cent.

The wholesale price index of the Bureau of Labor Statistics during the week ended April 11, at 152.1 per cent of the 1926 average, was 0.1 per cent more than in the preceding week and was 3.4 per cent below the corresponding figure in 1949.

Member bank reserve balances increased \$25 million during the week ended April 12. Underlying changes thus reflected include decreases of \$61 million in money in circulation, \$35 million in Treasury deposits with Federal Reserve banks, and \$4 million in Treasury cash, accompanied by a decline of \$64 million in Reserve bank credit and an increase of \$10 million in non-member deposits and other Federal Reserve accounts.

Total loans and investments of reporting member banks increased \$63 million during the week ended April 5. A decrease of \$61 million in commercial, industrial, and agricultural loans was recorded. The sum of these business loans, \$13,729 million, shows a net decline of \$998 million in 12 months.

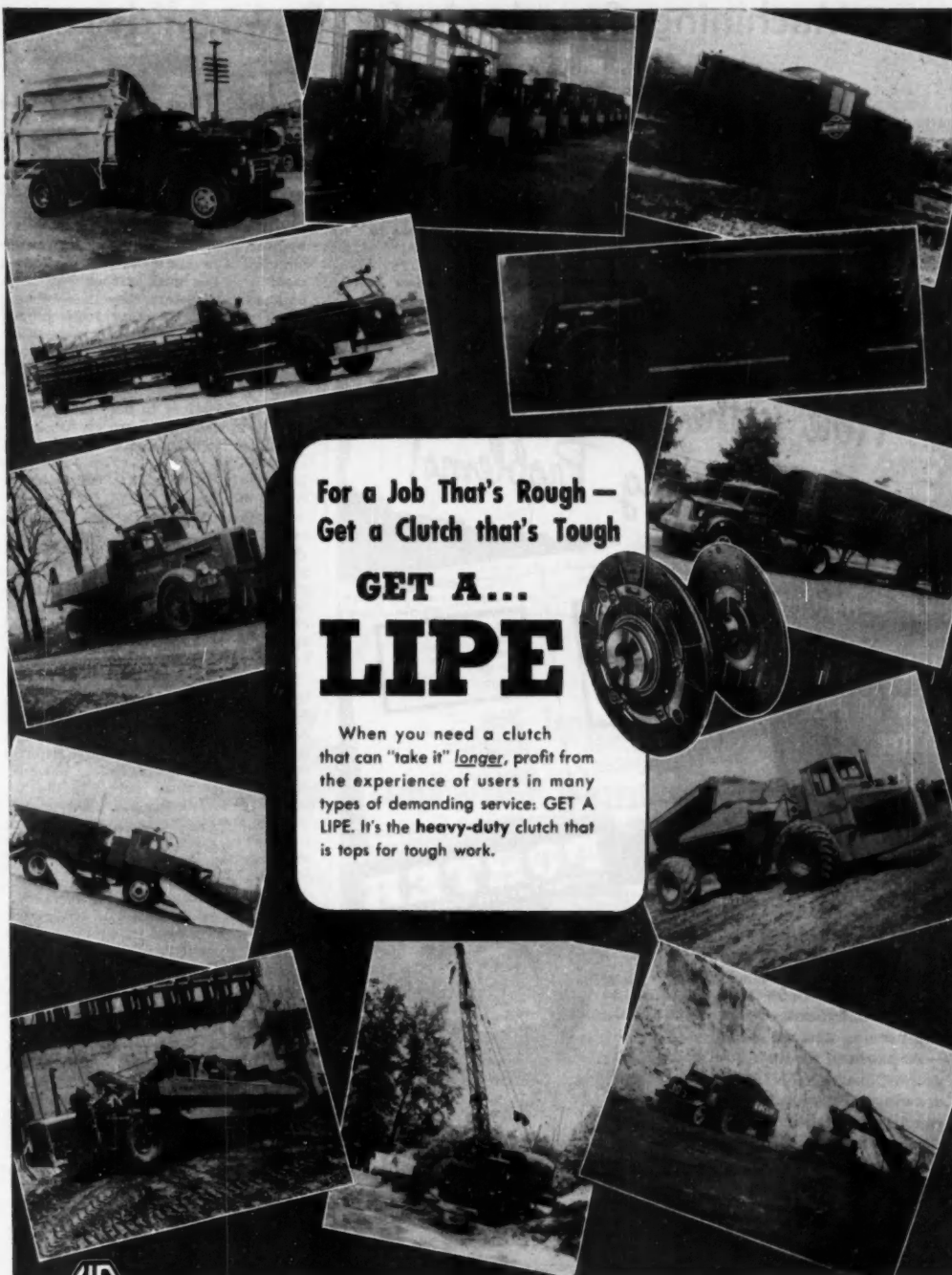
## BALLS FOR BEARINGS AND OTHER BALL APPLICATIONS



Precision balls made for your job — available in a variety of materials. Your specifications will receive prompt attention in our Engineering Department. We are thoroughly experienced in supplying the automotive industry with special bearings, retainers and balls. Let us give you our recommendations.

## THE HARTFORD STEEL BALL CO. HARTFORD 6, CONN.

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is tops for tough work.



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Syracuse 1, N. Y. Cable Address LIPEGAR

# Machining Standards for Powerglide

(Continued from page 45)

oil pump covers, require lapping. These parts are lapped in the familiar Norton Hypro-Lap equipment.

Since all oiltight joints are gasketed, extremely fine surface finish is not a requirement, although flatness definitely is. The Crane machine uses a cast iron lapping plate with 220 grain abrasive, suspended in liquid lapping vehicle fed to the plate. Norton machines use 280 grain vitrified wheels

with an ordinary type of coolant.

Gear practice is always of general interest and we have arbitrarily selected several gears as representative of what goes on in the gear department. The first example is the planet short pinion. Produced from bar stock, the pinions are rough-blanked in six-spindle, 2½-in. Model RA National Acme-Gridley automatics. The blanks then go to a battery of New Britain,

two-spindle, Mod. 26 precision boring machines. Here the blank is faced on both ends, chamfered on the ID and OD on both ends, finish-bored, and finish-turned on the OD of the gear. Of unusual interest is the vertical attachment for finish-turning and chamfering of the gear OD. This is followed by honing the bore in the familiar two-spindle Micromatic Microsize honing machine. The gear is then hobbled in eight-spindle, rotary Cleveland hobbing machines, and the gear teeth burrled in a Cross unit. Following some other detail operations, the gear is crown-shaved in a Model GCV eight-in. Red Ring diagonal gear shaving machine.

It is of interest to note some of the gear specifications: Tooth spacing error is held to 0.0002 in.; crown shave held to 0.0007 in. (max.); tooth form true to involute within plus 0.0000 or minus 0.0002 in.

The gear is carbo-nitrided in a Holcroft nitriding furnace and is then ready for finishing operations including grinding of grooves on a Heald surface grinder; grinding, honing and brushing the ends in one setting in a special machine made by Hoern & Dilts. Final operation is a second honing of the bore in a Micromatic Hydrohoner.

In the heat treating cycle, the work is carbo-nitrided, quenched in oil, then tempered for stress relief. Depth of case is held between 0.007-0.010 in., but the critical specification is the requirement that a minimum depth of 0.002 in. of martensite must remain in the finished bore. It is this specification that makes necessary the succession of bore treatments including precision boring in the green, honing in the green, and honing after hardening.

Supplementing the gaging inspection of finished gears, all gears are tested by hand rolling against a master gear in a Red Ring fixture.

Another interesting gear example is the planet reverse ring gear and drum which has internally cut teeth. This is a cast iron part, stress-relieved and desiliconized as described earlier. It is completely turned, faced, and bored in two chuckings in a single-index type, 12-spindle, Bullard Type K machine. Precision-boring, finish-facing of both ends, and finish turning of OD are done in separate settings in two Ex-Cello-O, single-end 2112A, double-spindle precision boring machines. The bore is held to a total tolerance of 0.0005 in. while OD is held to a total tolerance of 0.002 in. Incidentally, the OD of the hub is specified with a surface finish of 10-microinch.

Cutting of 79 internal gear teeth of 16 DP and pressure angle of 20-deg, is done in the spectacular 10-head, No. 10 Fellows rotary gear shaper, at the rate of about 110 pieces an hour. The

(Turn to page 88, please)

Here is the answer to your Spring Problems!

A Handbook on Springs free for the asking

**PORTER**  
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**SPRINGS**

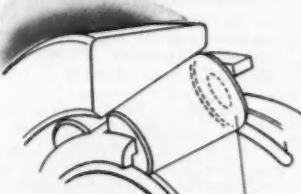
H. K. PORTER COMPANY, Inc.  
PITTSBURGH 21, PA.

If you are designing or making a product requiring a spring in its assembly, you will want this book—a 28-page handbook of engineering data on springs—28 pages of formulas, graphs, charts, tables and drawings. This book will tell you all you need to know about specifying springs of any type from light wire to heavy elliptical leaf springs. It's yours for the asking—write for your copy today.

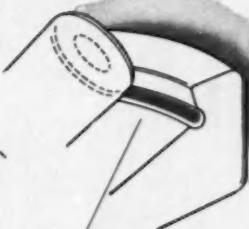
**AMERICAN-FORT PITT SPRING**  
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**BOWER BEARINGS ARE**

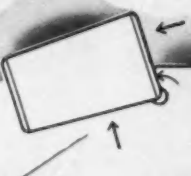
SPHER-O-HONED



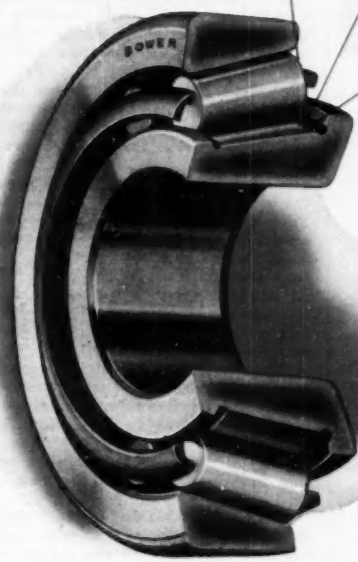
**SPHER**—Stands for generated spherical roll-head and flange surfaces designed and manufactured to the exact contour they would otherwise acquire in use. Alignment is improved; wear minimized.



**O**—Stands for the liberal oil groove which assures a generous supply of lubricant at the critical point where the roll-head operates against the flange, greatly reducing destructive friction.



**HONED**—Stands for hard, durable races which are honed to micro-inch smoothness. This bonus of precision eliminates the problem of run-out and also prolongs the life of the bearing.



...to improve your product  
and your plant equipment, too!

Look closely at Bower Spher-O-Honed bearings. Note these basic refinements in design and construction—generated spherical roll-head and flange surfaces; large oil grooves; precise, durable races.

You'll see they can benefit your manufacturing operation in two distinct ways:

Installed in your product, Bower bearings contribute positive dependability—wear resistance—long life. They can help make yours a better product, better able to meet competition.

Installed in your plant equipment, Bower bearings guard the precision of your machines—boost efficiency—reduce maintenance problems. They improve your ability to produce a quality product.

Whatever you manufacture, from limousines to bulldozers—and whatever plant equipment you use, from machine tools to lift trucks—it will pay you to standardize on Bower bearings.

**BOWER ROLLER BEARING COMPANY, DETROIT 14, MICH.**

**BOWER**  
**ROLLER BEARINGS**





# PRECISION LAPPING plus PRODUCTION SAVINGS!

with the new method

## Lapmaster "48"



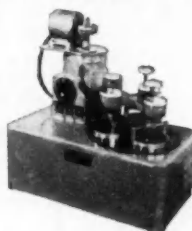
- The lapping plate of the LAPMASTER is automatically conditioned during the lapping cycle . . . no lost time for re-surfacing.
- The LAPMASTER quickly laps any soft or hard metals of various sizes and shapes . . . it handles many metal and non-metal parts never before finished by precision surface machines (ceramics, plastics, etc.).
- The lapping cycle of the LAPMASTER is automatically controlled . . . skilled labor is not necessary.

This revolutionary lapping machine answers your need for obtaining precision surfaces at a low production cost. It is easily accessible, simple to operate, and permits continuous lapping without the necessity of down time for lap re-conditioning. Its entire operation is automatic—the lapping cycle is timed, and "wet" compound is distributed to the lapping plate via the feed track in exactly proper amounts.

In one cycle, the Lapmaster "48" will precision-lap such diversified work as hydraulic parts, torque converter parts, bearing faces of pump gears, mechanical seal parts and gauge blocks—all to a flatness of .0000116" and a surface finish of 2 RMS or less. Its efficiency is so great that users have found that it is frequently faster than both the grinding and de-burring operations which it usually eliminates.

The Model "48" Lapmaster has a 48" lapping plate. Other models are manufactured with plate diameters of 12", 24", 36", 48", 60" and 72".

Write, on your letterhead, for a copy of our new, illustrated Lapmaster booklet: Crane Packing Co., Dept. A5, 1825 Cuyler Avenue, Chicago 13, Ill.



The Model "12" . . . designed for lapping small parts up to 4 1/4" in diameter.

## CRANE PACKING COMPANY

LAPMASTER DIVISION • CHICAGO 13, ILL.

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JOHN CRANE

gear is then shaved in a No. 11 Fellows internal gear shaver. Tooth form is specified true to involute within plus 0.0000, minus 0.0002 in. and maximum accumulated tooth spacing error held to 0.0002 in.

While on the subject of gears, it is well to mention that a battery of Michigan Tool underpass type gear shavers also is found here. They are used for shaving the pump gears.

This plant boasts one of the finest gear laboratories to be found in the industry. Its prime objective is to conduct research work, certify tool settings on new set-ups, certify hobs and shaving cutters, etc. In addition, however, the gear laboratory is responsible for regular routine inspection of every spindle of every gear cutting machine in the plant. This is done on schedule several times per shift. Naturally, too, the gear laboratory is always on the alert for trouble-shooting in the event of production difficulties.

Added to the extraordinary problems of precision manufacture with maximum economy, which place the operation on a new plane of activity, there is the problem of machining various sections of the fabricated sheet metal converter elements produced in Flint. Being fabricated of 1010 sheet steel, they are difficult to cut and produce stringy chips.

As in the case of other parts, machining is handled in two stages—rough and finish. In this case, roughing is done on versatile Lo-Swing lathes, using cemented-carbide tools and in some instances, Tantung tools. Finishing of the same surfaces is then done in Ex-Cell-O precision-boring machines.

Typical of the problem is the primary pump brazed assembly which is contained in a heavy housing. This part is chucked on the face of the vanes and the outside diameter of the housing. Tools enter from the rear in eight successive steps to face the inner and outer shells, bore the hole for the hub, and back face for the primary pump hub. All of the dimensions are held to close tolerances and, consequently, require subsequent finishing in an Ex-Cell-O precision-boring machine.

Generally speaking, cemented-carbide tools are employed on all parts wherever possible, particularly for boring, facing and turning. In some cases, of course, where the work is finished on a number of diameters in the same setting, high-speed-steel tools are used on smaller, slower rotating surfaces.

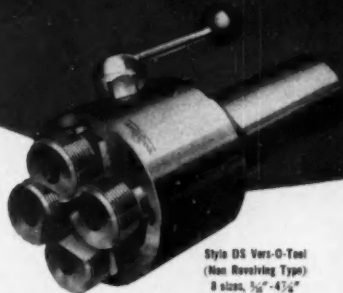
It is only natural to find that extensive gaging equipment has been made available to check the fine tolerances specified on Powerglide parts. An outstanding feature in this respect is the widespread application of Sheffield Precisionaire gaging machines for all bores, and for checking the OD of cam rings.

While on the subject of quality control, it is of interest to comment on the balancing of torque converter elements. Specifically they balance two of the parts—the turbine assembly, and an

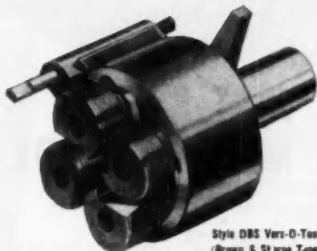
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# SIX REPORTS THAT POINT TO

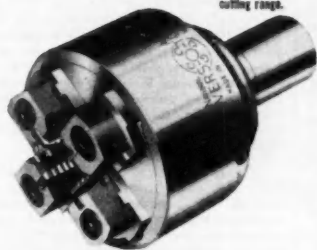
## VERS-O-TOOLS



Style DS Vers-O-Tool  
(Non Revolving Type)  
8 sizes,  $\frac{1}{16}$ "- $\frac{1}{2}$ "  
cutting range.



Style DBS Vers-O-Tool  
(Brown & Sharpe Type)  
3 sizes, .005"- $\frac{1}{16}$ "  
cutting range.



Style DR Vers-O-Tool (Revolving Type) 12 sizes  $\frac{1}{16}$ "- $\frac{1}{2}$ "  
cutting range with circular chasers; 6 sizes for  
adjustable blade chasers,  $\frac{1}{16}$ " to  $\frac{1}{4}$ " cutting range.

### for lower threading costs

- 1** A Chicago manufacturer of electrical goods states, "We have run 173,000  $\frac{3}{8}$ "-24 threads  $\frac{1}{2}$ " long on B-1113 with one grind of Vers-O-Tool chasers. This is at a circular chaser cost per grind of about  $1\frac{1}{2}$  mills per 1,000 pieces."
- 2** A large maker of brass fittings is getting 50,000 pieces per chaser grind on Vers-O-Tools equipped with Adjustable Blade Chasers cutting  $\frac{5}{8}$ "-8 Acme form double lead thread.
- 3** In one of the largest electrical plants a  $\frac{3}{8}$ " DR Vers-O-Tool threaded 30,000  $\frac{3}{8}$ "-32 brass pieces without regrounding the circular chasers. The chaser cost was .007 cents per thousand pieces as compared with a cost of \$1.60 per thousand by previous method.
- 4** On a No. 0 Brown and Sharpe, a brass specialty manufacturer reports on a DBS type Vers-O-Tool using hollow milling cutters running at 4150 RPM with a .0075 feed, consistently getting a 6-8 Micro inch finish—running for a year and grinding cutters once a week, average.
- 5** Operating  $\frac{3}{8}$ " DBS Vers-O-Tools with fine pitch Adjustable Blade Chasers, a screw products plant ran a lot of 20,000 stainless steel parts without chaser regrind or head adjustment. Customer adds—"Two sets of chasers paid for all threading equipment in first six months."
- 6** On a comparative test to determine threading chaser life and cost, a large plant makes this report on .099-.56 threads based on two runs of 16,000 pieces: "Former tool cost \$1.75 per 1,000 threads;  $\frac{5}{8}$ " DR Vers-O-Tool cost 10 cents per 1,000 threads."

Isolated endorsements are a dime a dozen. Taken individually, they don't prove a thing. But when customer after customer reports the same cost-cutting advantages, the same superior operational performances, the answer must lie in the Namco Vers-O-Tool's unique design and construction features.

Among these are the famous circular chaser, re-grindable through a full 270°, the speed and ac-

curacy of operation and the time-saving advantages of simplified set-up, easier regrounding. Moreover, the versatility of a single Vers-O-Tool head in handling threading or hollow milling, using either circular chasers or adjustable blade chasers—each interchangeable, size for size, on all three types of heads—means important economies in tooling costs. For more facts, ask for Catalog D-49.

## The NATIONAL ACME CO.

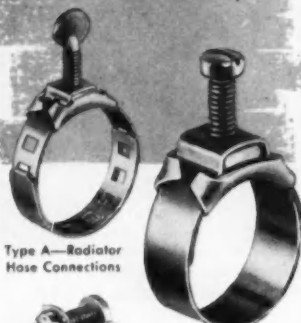
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics:  
1-4-6 and 8 Spindle • Hydraulic Thread  
Rolling Machines • Automatic Threading Dies  
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## NOC-OUT HOSE CLAMPS

*The Standard  
of the Automotive  
Industry*



Type A—Radiator  
Hose Connections



Type HP—High  
Pressure Hose  
Connections

Type G-BB—Booster  
Brake Hose Connections  
No. G-B-NH  
for Hot Water  
Heater Hose

Wittek Noc-Out Hose Clamps are designed in a variety of types made in many sizes for use by the automotive industry. Because they provide the most practical leakproof hose connection, they are specified by the leading manufacturers as standard, original equipment for automobiles, buses, trucks and tractors.

Write for descriptive literature.

**WITTEK**  
Automotive  
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CLAMPS  
**MANUFACTURING CO.**  
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Dependability in Hose Clamps  
for Over a Quarter of a Century

assembly composed of the primary pump, housing, and cover. The latter is made up in a temporary sub-assembly for balancing and filled with a measured charge of oil. Chevrolet does not balance the entire torque converter as an assembly.

The two elements, mentioned above, are balanced in familiar GMR static balancing machines of rotating type, holding balance to a tolerance of  $\frac{1}{4}$ -oz. in. Balance is achieved by welding on a slug of suitable weight. In the case of the housing, the slug is applied on the element about midway between the front and rear surfaces of the assembly. Considerable checking of the same assembly in a GMR horizontal type dynamic balancer has shown that static balancing procedure as described is perfectly acceptable, making dynamic balance procedure unnecessary.

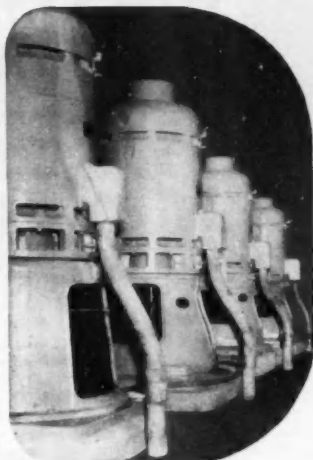
## Quick Inspection Methods

(Continued from page 47)

dye penetrant will show the crack. We do not feel that any surface method should be used in place of magnetic inspection, since that finds inclusions and often points out sub-surface flaws. However, we had a definite need for any inspection technique which would detect tiny fatigue cracks on any sort of metal, and it is for that purpose that we use the dye penetrant.

When repairs are made by welding, it is easy to check for crater cracks, lack of fusion, or porosity. Our welders quickly became accustomed to the dye inspection, and one man recently turned it to his own advantage. When he was unable to make the gas mixtures remain constant, he removed the regulator from the oxygen tank and checked it with dye penetrant. The cracks on this brass casting are shown in Fig. 3. Because they were right in the radius, they could not be seen visually before using the dye; but one crack was so wide that the red started oozing out, even before the developer was applied. A line of little red dots on the outer surface proved that the crack extended through the whole section, thus explaining the loss of oxygen pressure.

This method of inspection is extremely portable, and any part which can be seen and reached may be inspected. It is not necessary to take a part out of its assembly. Such defects as cracks in cylinder heads have been found, without tearing down the engine. Since this method depends for its accuracy on the mechanical capillary action of the penetrant, it works equally well on any metal, and it does not matter whether the cylinder head is aluminum or iron. We have used it on aluminum (anodized or bare), steel, stainless steel, Inconel, magnesium, copper, brass, and hard-facing alloys with good results from all.



## JUST ASK MOST ANYBODY

While there is some chance that we might be prejudiced, our people believe that Layne well water systems are the very finest now being built. However, you can get your facts first hand by doing a little investigating of your own. Just ask most anybody who owns a Layne well water system if he considers them to be okay?—Are they low in upkeep cost—big in volume production—designed right—built of good stuff and then installed and serviced by people who seem to know their business?

We don't know exactly what kind of answers you will get, but according to past records, the "know how" boys — operating engineers, plant managers, water works superintendents and cost accountants will be mighty, mighty complimentary. They are the first to recognize and show genuine appreciation of good equipment. A list of your nearby Layne well water system owners will be sent on request. For other helpful materials—illustrated catalogs and folders, address

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GENERAL OFFICES, MEMPHIS 8, TENN.

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## Truck Wheel

with Improved

*2 piece rim*

*For SAFER and EASIER*

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*Increases—*

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Available in all Popular Sizes for  
Leading Makes of Trucks



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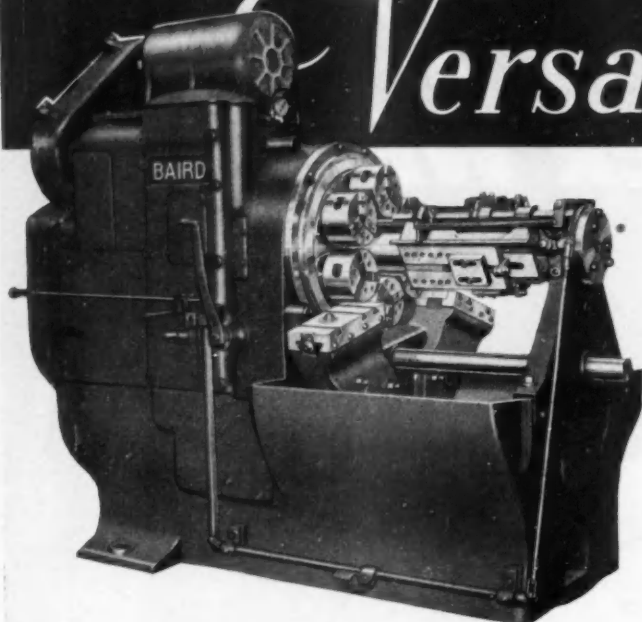
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PRODUCTS: Wheels—Hub and Drum Assemblies—Brakes—Vacuum Brake Power Units—for Passenger Cars, Trucks, Buses—Electric Brakes for House Trailers and Light Commercial Trailers—Wheels, Hubs, Axles, Parts for Farm Implements.

PLANTS: Kelsey-Hayes Plants in Michigan (4); McKeesport, Pa.; Los Angeles, Calif.; Davenport, Iowa; Windsor, Ontario, Canada.

# Versatility!



★TURN  
★BORE  
★FACE  
★GROOVE  
★DRILL and  
★TAP

with the

## BAIRD 76H CHUCKING MACHINE-

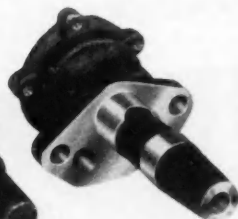
This machine has independently operated tool slides, different speeds for the different spindles, automatic chucks, attachments or means to mill or cross mill, etc., etc.

### THE PART, A CAST IRON OIL PUMP BODY



**1st OPERATION**—Face flange, finish counter-bore I D and depth, cut groove in flange, drill and tap 5-29/64" holes.

308 pieces per hour, gross. Work is held stationary during drilling and tapping operations.



**2nd OPERATION**—Face and turn shank end, under cut spot drill and then drill center hole through to cored section, turn O D of shank, ream center hole, drill 2-15/32" holes.

222 pieces per hour, gross.

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The BAIRD MACHINE COMPANY, Stratford, Conn.  
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It's hard to beat the thrill of rolling over the beautiful countryside on a powerful, smooth-riding Harley-Davidson motorcycle. But when you gotta stop, you gotta stop! That's why you will find every H-D equipped with a real "stopper"—a brake that's strong and dependable. One element that makes it strong and dependable is the brake drum, spoke flange, hub assembly illustrated.



## IT'S EASY-FLO BRAZED



The drum is induction brazed to the hub with a ring of EASY-FLO 43 preplaced at the joint—71 per hour. The spoke flange is brazed to the hub the same way—106 per hour. Assemblies are fully equal to the solid metal in strength and all other essential properties. This is one more example of the high strength and fast production characteristic of EASY-FLO brazing—features that go hand-in-hand with low costs.

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This exceptionally simple, versatile method of fabricating ferrous, non-ferrous and dissimilar metal parts has drastically boosted production and slashed costs for thousands of manufacturers on thousands of different parts—a fact which makes it practically a "sure thing" that it will do the same for you on some of your parts. Don't put off these savings—especially when it's so easy to put EASY-FLO to work. Bulletins 12-A and 15 will give you the basic facts. Write for copies today.

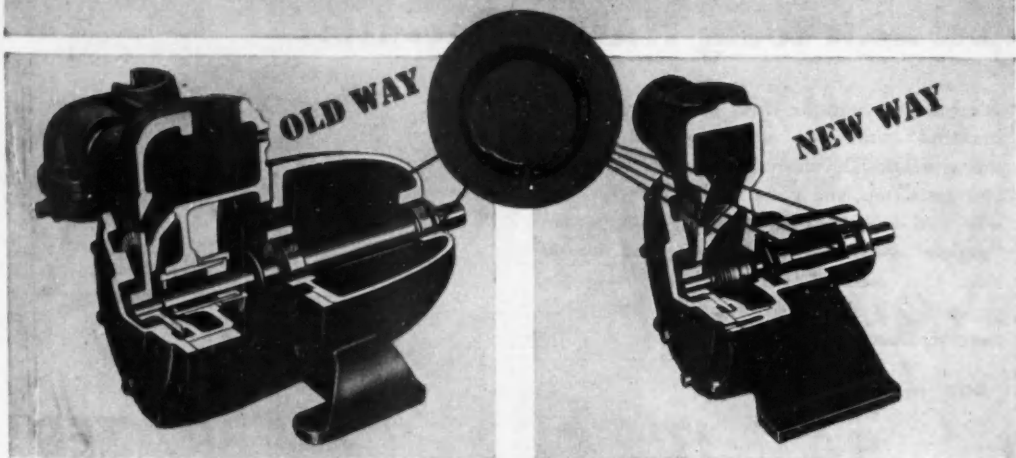
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## REDESIGN TRIMS LENGTH $5\frac{1}{4}$ INCHES, CUTS UNIT COST \$5.70



Series D Wayne water pump uses machined shoulders to position bearings on shaft. 2 Truarc rings hold bearings in housing. Locknut holds screw-type stuffing box that requires periodic tightening.

New design uses 4 Truarc Inverted rings (2 external, 2 internal) to position shaft, retain bearings. Inverted rings provide shoulders of uniform section height. 1 Standard ring secures maintenance-free mechanical seal.

Redesign with Truarc Rings helps save \$5.70 per unit for Wayne Home Equipment Company, Inc., Fort Wayne, Ind. It gives them a more compact product, eliminates a separate bearing pedestal and a skilled-labor grinding operation. It facilitates use of maintenance-free mechanical seal instead of old type stuffing box.

Redesign with Truarc Rings and you too will cut costs. Wherever you use machined shoulders, nuts, bolts, snap rings, cotter pins, there's a Truarc Ring that does a better job of holding parts together.

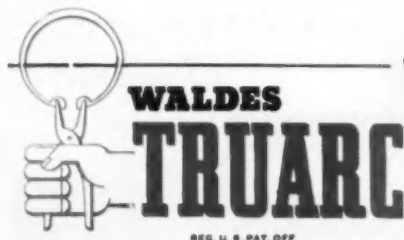
Truarc Rings are precision engineered. Quick and easy to assemble, disassemble. Always circular to give a never-failing grip. They can be used over and over again.

Find out what Truarc Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

### REDESIGN WITH 5 TRUARC RINGS GIVES THESE BIG SAVINGS

- Cuts length  $5\frac{1}{4}$  inches
- Cuts total labor 15.3%
- Eliminates skilled-labor grinding operation
- Saves 38.3% materials
- Allows use of stock-size shaft, smaller bearings
- Eliminates separate bearing pedestal

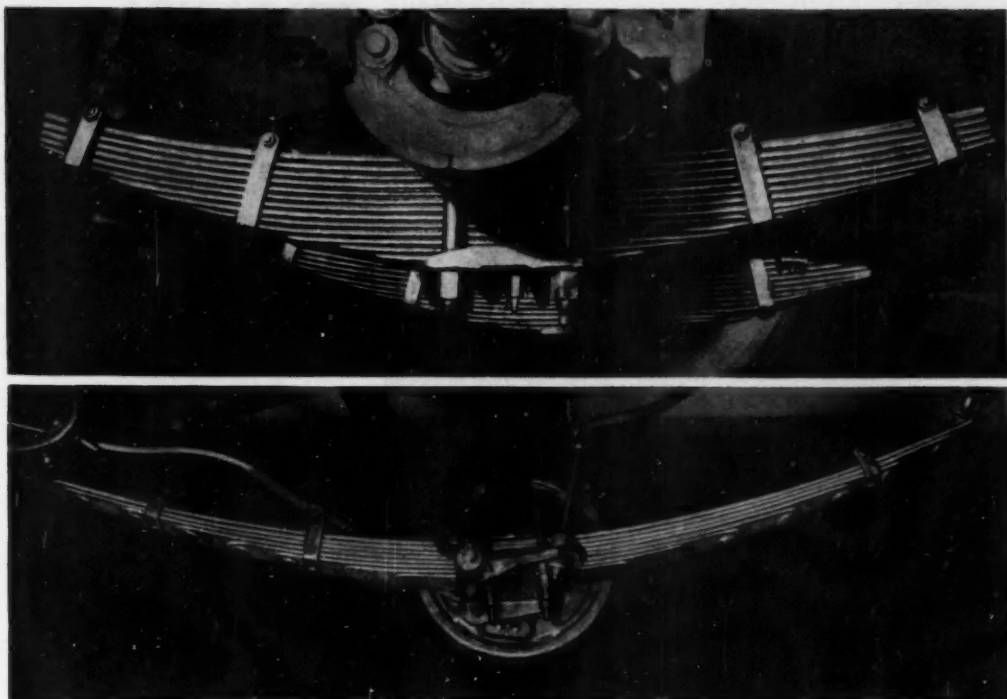
**TOTAL UNIT SAVING... \$5.70**



### RETAINING RINGS

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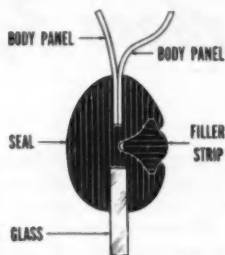
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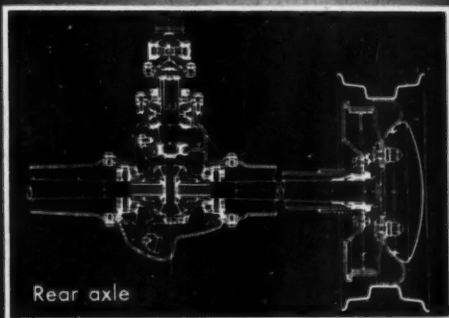
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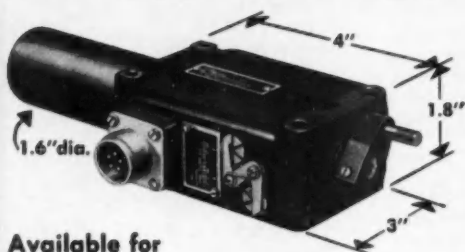
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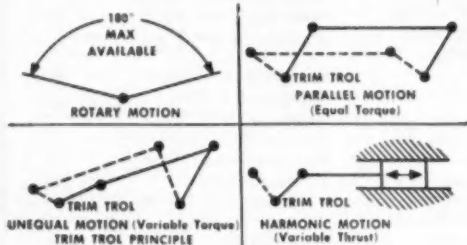


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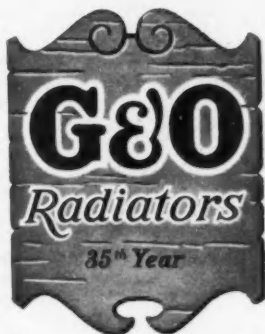


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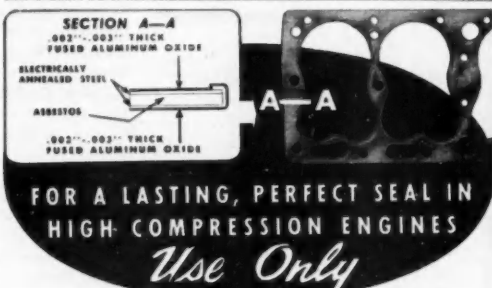
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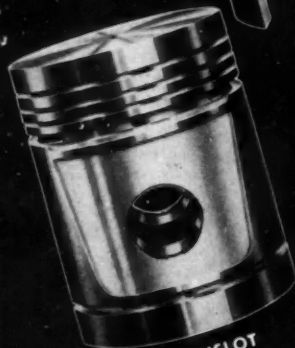
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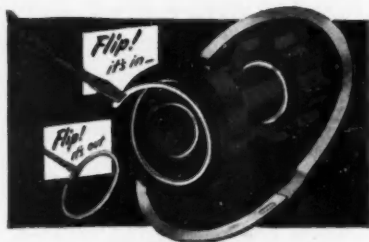
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